GSMO TASK ORDER

Task No:	12
Modification:	10
Task Name:	EDOS Operations and Engineering
Task Period of Performance:	3/1/2012 to 2/29/2016
Modification Period of Performance:	8/1/2015 to 2/29/2016
GSMO SOW Reference:	2.3.2.6, 3.6, 3.7.2

I.   Task Order History

Description of current modification:

Modification #0: The initial task order statement of work for the EDOS Operations and Engineering task

Modification #1: To procure capture devices to support ASF and McMurdo ground station antenna upgrades

Modification #2: Submit yearly renewal of GSMO task order 12

Modification #3   Administrative change to replace Branch Head

Modification #4   Implementation of WAN Accelerator software

Modification #5   Yearly task order renewal/extension

Modification #6   Procurements for EDOS expansion to USN North Pole

Modification #7   JPSS SW/HW for NASA SIPS Support & Tech Refresh

Modification #8   Yearly task order renewal/extension

Modification #9   Administrative change to replace Project Resource Analyst

Modification #10   Procurements for tech refresh of end-of-life equipment

Modification #11   Procurements to support EDOS interface with JPSS Block 2.0

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	4/16/2012	02/28/2013	Purchase capture devices to support ASF and McMurdo ground station antenna upgrades
2	03/1/2013	02/28/2014	Yearly task order renewal/extension
3	03/1/2013	03/15/2013	Administrative change to replace Branch Head
4	08/1/2013	09/30/2013	Implementation of WAN Accelerator software
5	03/01/2014	02/28/2015	Yearly task order renewal/extension
6	05/15/2014	9/30/2014	Procurements for EDOS expansion to USN North Pole
7	08/01/2014	02/28/2015	JPSS SW/HW for NASA SIPS Support & Tech Refresh
8	3/1/2015	2/29/2016	Yearly task order renewal/extension
9	4/24/2015	2/29/2016	Administrative change to replace Project Resource Analyst
10	6/1/2015	2/29/2016	Procurements for tech refresh of end-of-life equipment
11	8/1/2015	2/29/2016	Procurements to support EDOS interface with JPSS Block 2.0 for SNPP and JPSS-1/2 Spacecraft

II.   Background

The purpose of this task order is to provide operations and engineering support to the Earth Science Mission Operations (ESMO) Project's Earth Observing System (EOS) Data Operations System (EDOS).

For selected EOS missions, EDOS provides: (1) high-rate real-time science data capture and front-end processing (frame synchronization, decoding, and error correction), (2) high-rate priority-based network transfer to GSFC, (3) production and distribution of near-real-time (rate-buffered) products, and (4) centralized production and distribution of Level Zero time-based and session-based products. Additionally, EDOS provides short term (30-day) unprocessed data storage as well as life of mission archival storage for Level Zero products.

EDOS is a multi-mission system that currently supports the following missions: Terra, Aqua, Aura, EO-1, and Suomi NPP.   Pre-launch engineering support is also provided for the following missions in preparation for future EDOS support: OCO-2, SMAP, and ICESat-2.

EDOS is comprised of locally and remotely located components including the: Level Zero Processing Facility (LZPF) and Backup Level Zero Processing Facility (BLZPF) at GSFC, a Development and Test Facility at GSFC, Ground Station Interface Facilities (GSIFs) at White Sands, Wallops, Svalbard (Norway), Gilmore Creek (Alaska), USN North Pole (Alaska), and the Alaska Satellite Facility, and a Data Archive Facility (DAF) at White Sands. EDOS is centrally operated 24 hours a day, 7 days a week, delivering approximately one Terabyte of data daily to more than 20 customers worldwide.

This task is primarily funded by the collection of Earth Science Mission Operations (ESMO) missions of Aqua, Aura, and Terra. In most cases, the work on this task is in support of resources that are shared across all the missions. As a result, distinguishing subtasks by funding sources would cause additional accounting work that is of little value to the project.

III.   Scope of Work

For this task order the contractor shall provide EDOS operations and engineering services necessary to meet the requirements for the EDOS system as specified in the applicable Functional & Performance Specifications (F&PS), Interface Control Documents (ICD)s and Operational Agreements (OA)s.

(1)   The contractor shall perform **project management functions** which include planning, managing and coordinating EDOS-related engineering and operations functions specified within this task to ensure that EDOS data capture, production, and delivery requirements are met for current and future missions within budgetary constraints.

(2)   The contractor shall perform **operations support functions** such as 24x7 monitoring over 80 passes per day to insure that all products are produced and delivered within their required latency, troubleshooting operations problems and reprocessing/redelivery, monitoring the ESMO network assets for the Network Operations Center (NOC), compiling metric reports on EDOS delivery performance, quality assurance testing of delivered software releases, obtaining data from direct broadcast users to fill missing data gaps on request, and drafting/maintaining OAs with end users.

(3)   The contractor shall perform **software development and sustaining software engineering functions** such as developing software to meet new mission requirements as well as maintaining EDOS custom software components, integration and development-level testing, and delivery to operations.

(4)   The contractor shall perform **hardware sustaining engineering functions** such as insuring that adequate local and remote systems are in place to meet end user goals, maintaining all local hardware and at geographically remote stations, and recommending replacement of hardware approaching end-of-life support.

(5)   The contractor shall perform **hardware and software maintenance functions** such as interfacing with hardware vendors to insure failed hardware components are repaired in a timely manner and insuring software vendor agreements are in place and kept current.

(6)   The contractor shall perform **database administration functions** including database administration for all Oracle operational and development databases.

(7) The contractor shall perform **systems/network administration functions** which include systems and network administration of all EDOS systems, both local and remote, monitoring performance of all high-rate WANs connecting remote stations, controlling EDOS IP address assignments and firewall rule requests, and performing IT security for all EDOS systems adhering to all NASA and ESMO security policies.

(8) The contractor shall perform **systems and mission engineering functions** including maintaining historic knowledge of EOS mission spacecraft and telemetry specifics, perform end-to-end systems engineering and re-engineering, analyzing requirements provided by new mission customers and drafting/maintaining Interface Control Documents and requirements documents.

(9) The contractor shall perform **software, hardware, and documentation Configuration Management (CM) functions** to ensure the system is executing the correct versions of software and hardware components. Also ensure documentation is current.

A.　Requirements

The following categories provide the detailed technical requirements needed to implement this Task Order by functional areas.

A.1　The contractor shall perform the following technical Project Management functions:

- Ensure that resources are adequate to meet project schedules and deliverables.
- Ensure project schedules and budgets are met.
- Ensure monthly project status report is delivered on schedule.
- Ensure availability and competence of the work force necessary to execute the technical activities specified in this Task Order.
- Generate a detailed technical staffing approach and ensure the project is staffed with appropriate skill levels and number of personnel.
- Ensure task stays within scope as specified within this SOW.
- Plan. manage and coordinate EDOS-related ▬ support with prime vendor, ▬▬▬▬
- Provide technical coordination between EDOS and other GSMO and ESMO organizations.
- Promote EDOS capabilities within ESMO and other organizations for future EDOS mission support.

A.2　The contractor shall perform the following technical Operations Support functions:

- Monitor data capture for Suomi NPP mission and Direct Readout Laboratory.
- Monitor and evaluate TrollSat test passes and provide feedback to EO-1 MOC.
- If applicable, monitor and evaluate TrollSat operational passes from various EOS satellites such as EO-1
- On-console system operations at the EDOS LZPF/BLZPF for all EDOS-supported missions, routine monitoring of nominal operations and the handling of contingency transactions.
- Daily troubleshooting to handle anomalies for ground station issues, resolution of missing or partial data, reprocessing of previously delivered data to resolve anomalies.
- Analysis of on-board spacecraft anomalies affecting X-band science at the request of Flight Operations.
- Ensure that the EDOS system generates and electronically delivers EDS/PDS products to EDOS customers within 3/24 hours of receipt of last bit of data 95/98% of the time
- Ensure that the EDOS system generates and electronically delivers rate-buffered data within 3 hours of receipt of last bit of data at least 95% of the time.
- Ensure that the EDOS system generates and electronically delivers real-time data (selected VC streams) within 5 minutes after receipt of data.
- Monitor product delivery completeness by product including numbers and percents of products. Where this metric is also requested from another ESMO task, the same data, graphs, and/or charts may be provided by generating unique charts for this task. Provide metrics to EMS system in an appropriate format.
- Monitor system operations, taking approved corrective actions and following problem escalation procedures, as necessary. Insure work instructions are kept up to date.
- Offer alternative operations concepts and procedures in support of evolving system and mission processes and/or to improve ongoing operations.

- Coordinate new activities with appropriate Flight Operations Teams, Mission Directors, and all affected customers, as needed.
- Participate in Project Configuration Management Board (PCMB). Provide analysis and impacts on DRs and Configuration Change Requests (CCRs) using GFE automated tools. Generate discrepancy and problem reports.
- Apply EDOS operations engineering expertise and other level zero system experience to enhancements for system automation, operability, flexibility, and reduction of life cycle costs.
- Perform integration and system-level testing of software changes, including test-planning, execution, and reporting.
- Coordinate with ground station support tasks as needed, including non-routine operations, test support, corrective and preventive maintenance of EDOS hardware and software, and EDOS DAF operations.
- Perform system Acceptance Testing on software releases provided by the EDOS Software Engineering team.
- Provide representation at EDOS status and briefing meetings and provide regular reports to NASA regarding operations status, testing progress and plans.
- Participate in, and evaluate, regression testing of the interfaces within the EDOS system and between EDOS and external customers.
- Provide drafts of new OAs and periodic updates to existing OAs.
- Provide backup network monitoring for the ESMO network operations, including opening trouble tickets and coordinating problems with the on-call network engineers.
- Participate in pre-launch readiness tests, launch support, early orbit checkout, and sustaining operations for new missions OCO-2 and SMAP.
- Participate in ASF certification with FOT for AS1 and AS3 support of Aqua. Aura, Terra, and EO-1 missions.
- Participate in USN North Pole certification activities for selected EOS missions.
- Provide operational support for the SMAP Emergency Control Center hosted by ESMO by monitoring the health of the system and reporting problems back to SMAP project.

A.3   The contractor shall perform the following Software Development & Software Sustaining Engineering functions:

- Automate product delivery verification to display the delivery and completeness of data products to end users (HOS visual management).
- Process NPP EAPS for input to ESDIS /mini-IDPS to reduce the amount of missing/data gaps.
- Provide alternative designs to "strip-and-ship" of selected VCIDs and/or APIDs from the X-band downlink to users of direct broadcast (DB) data who are impacted by X-band downlink interference with DB. Alternatives should include sending the data from the ground station (via Ebox-S) or from LZPF (when data is delivered in real-time to LZPF via high-rate circuits).
- Implement near real-time quick-look displays for NPP/VIIRS, Terra/MODIS, and Aqua/MODIS.
- Implement priority queuing software enhancement for MODIS (and other high-priority) data.
- Design and implement new high-rate matrix switch control software and integrate with Monitor and Control GUIs.
- Perform interface testing between the Cortex HDR XXL receiver and the Ebox-S clock-and-data serial interface at Wallops and ASF needed for SMAP and OCO-2.
- Implement software required to support new mission customers including but not limited to OCO-2, SMAP, and ICESat-2.
- Provide development and test system software maintenance.
- Provide content and schedules for software releases including detailed schedules reflecting workload, task duration, and resource allocation. Also include dependencies and critical path in detailed schedule.
- Provide design updates, as necessary, including documentation updates to as-built specification.
- Study and develop scripts required for system performance improvements.
- Support preparation of system test plans and procedures.
- Troubleshoot, and resolve major system problems via short term workarounds and follow up with permanent patches.

- Provide 24/7 on call support for emergency or critical situations such as an operational transition.
- Implement latency enhancements whenever possible to provide end user products as soon as possible.
- Obtain, assess, install, and configure vendor software upgrades including COTS and GOTS.
- Resolve discrepancy reports (DRs) based on priorities set by the EDOS review board and according to staff skill mix. Provide updates to DRs via the DR tracking tool.
- Implement software and database changes based on priorities set by the appropriate EDOS review board and according to staff resource levels.
- Detect, troubleshoot, and resolve system, software, database, and interface problems.
- Adhere to ESMO and element software configuration management (CM) practices for delivered changes.
- Update the appropriate user guides, as necessary due to approved software changes.
- Coordinate with hardware maintenance, Database, Mission Engineering, and System Administration for the resolution of problems, upgrades, and cross-impact items.
- Review and adhere to element F&PS, ICD, and Operation Agreements (OA) documents
- Provide User assistance as needed in support of EDOS operations.
- Participate in Project Configuration Management Board (PCMB) as requested. Provide analysis and impacts on DRs and Configuration Change Requests (CCRs) using GFE automated tools.
- Contractor is requested to implement an upgraded WAN transfer protocol: UDT. UDT is an open-source, high performance UDP-based data transfer protocol. It was designed for data intensive applications over high speed wide area networks, to overcome the efficiency and fairness problems of TCP and long round trip delays. The contractor shall integrate the UDT toolkit with existing EDOS WAN software to meet the following requirements:

1. The existing legacy application interface between MDIS_sender and IPIN shall be maintained, including near real-time streaming, optional checksum, optional file size, optional compression and any applicable headers and trailers. This will minimize changes needed on the Ebox-R to implement the "WAN Accelerator" design.
2. The "WAN Accelerator" shall augment the MDIS_sender (both the EBOX-S 1.8 and EBOX-S 2.0 series) to IPIN (EBOX-R 1.9 series) interface to provide reliable, error-free, high-rate end-to-end delivery.
3. The "WAN Accelerator" shall be able to maintain a steady MDIS_sender output rate of up to 300 Mbps (assuming available network bandwidth) which can be changed by a configuration setting in the Ebox-S.
4. The "WAN Accelerator" output rate shall be independent of round trip delay.
5. The "WAN Accelerator" shall be able to maintain max throughput with MTU size configured between 1300 to 6000 bytes.
6. The "WAN Accelerator" implementation shall be IPV6 compatible.
7. The "WAN Accelerator" shall be able to automatically adjust to decreased bandwidth availability, due to QoS or network congestion. When situations limiting available bandwidth have eased, the "WAN Accelerator" will resume its intended throughput rate.
8. The "WAN Accelerator" shall be able to adjust its performance to withstand an "underflow" situation, where the data input rate is slower than the configured MDIS_sender output rate.
9. The "WAN Accelerator" shall provide reliable MDIS_sender (Ebox-S) to IPIN (Ebox-R) end-to-end delivery within a WAN environment where the Bit Error Rate (BER) is 10^{-6} or less.
10. The Ebox-S shall be configurable to use the standard TCP-based MDIS_sender or the "WAN Accelerator" version, as needed, to use both the existing closed network interfaces or the high-rate open network interfaces as desired.

11. The Ebox-R shall be capable to communicating with an Ebox-S configured with the "WAN Accelerator" design and an Ebox-S configured with the standard TCP-based MDIS_sender concurrently.

- The contractor shall implement software changes needed to support operational delivery of Science Data for SNPP and JPSS-1 to SIPS, including:
    1. Generation of Time-based and session-based PDS files for 1 or more APIDs
    2. Provide ICD and OA documentation between EDOS and ESDIS
- Implement SLE protocol in the Ebox-R to support and test the EDOS interface to the JPSS SMD Hub (JSH) required for the Block 2 JPSS design for both the SNPP and JPSS-1 spacecraft.

- Develop and integrate the monitor and control software and middleware needed to support the new HRDFEPs as part of the ongoing EDOS tech refresh activities.
- Develop software needed to support new mission ICESat-2 level-zero processing and delivery, including firmware changes on the HRDFEP to identify ICESat-2 and GPS timing software modifications.
- Implement quick-look visual software for MODIS (Terra, Aqua) and VIIRS (SNPP) to enhance console operations, quality verification, and visitor public relations.
- Provide a software design for virtualization of the EDOS back-end software (Ebox-R) to eliminate mission specific Ebox-R assignments and failover challenges.
- Provide an operations concept and high-level design to automatically verify successful delivery of routine data products.
- Develop and integrate the monitor and control software, middleware (MW3), and GUIs needed to integrate the EDOS JPSS SMD Hub hardware systems into the EDOS system.

A.4   The contractor shall perform the following Hardware Sustaining Engineering functions:

- Deploy data logger equipment at Gilmore Creek to store EOS mission data for GLA, GLB, and GLC antennas.
- Deploy new high rate matrix switch at Wallops for interfacing the Ebox-S with the Cortex XXL equipment.
- Support 10 meter and 11 meter antenna upgrades by installing and testing several Ebox-S(s) at ASF with supporting hardware (NAS, log server, QoS, etc.).
- Support local testing (GSFC) of the McMurdo MTRS-II Phase 1 interface to Ebox-S.
- Support antenna upgrades at McMurdo (prime location) and TrollSat (backup location) that involves testing hardware interfaces between MTRUII and Ebox-S, data transfers between the hardware components, and network performance from the Antarctica to GSFC.
- Design and deploy the TrollSat and McMurdo operational hardware configurations, as needed.
- Evaluate alternatives and determine how to provide backup tapes of EOS mission data for the life of mission plus 3 years as follow-on to the Data Archive Facility (DAF) tape conversion project.
- Explore the concept of implementing and deploying virtual Sbox(s)/Rbox(s) into development and test, BLZPF, and operations.
- Maintain the LZPF operations, development and test, BLZPF, and DAF environments as required.
- Procure hardware equipment as necessary to meet mission requirements with task monitor approval.
- Provide maintenance of EDOS high-rate matrix switches at Norway, Alaska, Wallops, and White Sands, as needed.
- Detect, troubleshoot, and resolve system, hardware, and interface problems.
- Coordinate with software and network maintenance for the resolution of problems, upgrades, and cross-impact items.
- Provide content and schedules for hardware maintenance activities including detailed schedules reflecting workload, task duration, and resource allocation. Also include dependencies and critical path in detailed schedule as required.

- Provide design updates, as necessary due to approved hardware changes, including as built design documentation, cabling and network diagrams.
- Provide 24/7 on-call support for emergencies such as operational transitions and launch support.
- Obtain, assess, install, and configure vendor hardware upgrades/replacements including COTS and GOTS.
- Report on hardware obsolescence and provide engineering recommendations to ensure compatibility between development, test, operational and backup system strings and extended end-of-life through 2020.
- Evaluate options to reduce hardware maintenance costs and provide engineering recommendations.
- Implement hardware modifications based on priorities set by the Task Monitor and according to staff resources.
- Implement latency enhancements to provide end user products as soon as possible.
- Participate in Discrepancy Review (DR) Board and Project Configuration Management Board (PCMB); provide analysis and impacts on DRs and Configuration Change Requests (CCRs) in GFE automated tools where available.
- Adhere to ESMO and EDOS hardware CM practices for delivered changes.
- Update User's Guides, work instructions, or CM documents as necessary due to approved hardware changes.
- Perform system enhancements, augmentation and replacement as approved by the task monitor.
- Perform procurement specifications and procurement package preparation.
- Perform feasibility, proof-of-concept and cost tradeoff studies as directed by the Task Monitor.
- Perform firmware maintenance and upgrades as necessary.
- Provide training on new systems as needed.
- Travel to remote sites for new equipment installations, system modifications or system reconfigurations that cannot be performed remotely or by site personnel.
- Procure and install EDOS hardware needed at the USN North Pole ground station in Fairbanks, Alaska to support data capture and delivery for 2 X-band antennas.
- Deploy and test the legacy EDOS HRDFEP servers to Gilmore Creek and Svalbard for contingency support of SNPP.
- Procure Ebox-R hardware to provide level zero processing and product distribution to the SIPS for both SNPP and JPSS-1 in EDOS LZPF and BLZPF environments.
- Procure four (4) new HRDFEPs as replacements for end-of-life ebox-S front-end systems as part of ongoing EDOS tech refresh activities.
- Procure six (6) additional new HRDFEPs as replacements for end-of-life ebox-S front-end systems as part of ongoing EDOS tech refresh activities.
- Procure and integrate the hardware platforms necessary to support the new monitor and control functions for the new HRDFEPS.
- Support the migration of PF1 and PF2 antennas from USN Poker Flat to USN North Pole.
- Install new high-rate matrix switches at all ground stations as upgrades to existing obsolete switch hardware, capable of supporting higher data rates (e.g. ICESat-2 at 220 Mbps).
- Procure three (3) additional new HRDFEPs as replacements for end-of-life ebox-S front-end systems as part of ongoing EDOS tech refresh activities.
- Procure ten (10) Drop-Box servers as replacements for end-of-life Drop-Box servers as part of ongoing EDOS tech refresh activities.
- Procure twelve (12) QoS servers as replacements for end-of-life QoS servers as part of ongoing EDOS tech refresh activities.
- Procure ▬▬▬▬ custom IF data modulator to provide test data generator capability to test IF input to new HRDFEP systems.
- Procure operational and development JPSS SMD Hub hardware systems (MEOS Packet Processor Hub) from ▬▬▬▬▬▬ to support JPSS Block 2.0 interface. These systems must be similar to the units delivered to the JPSS project.
- Procure a "TCP/IP-SLE Converter" from ▬▬▬▬ to act as a JSH simulator for EDOS development and interface testing.
- Procure the new hardware platforms (and license) for the new MW3 monitor and control for both the operational and development EDOS systems. These new platforms are needed to support the new middleware (MW3) associated with the new JSH and HRDFEP systems.

- Procure a new 16x16 ECL serial matrix switch to support additional switch ports needed for planned antenna upgrades at University of Alaska Satellite Facility.

A.5   The contractor shall provide the following Hardware and Software Maintenance functions:

- Report and respond to system availability including minutes and percent of down time
- Provide 24x7 best efforts response.
- Repair or replace hardware equipment without service agreement support as directed and funded by Task Monitor.
- Manage all software license, hardware maintenance, and hardware warranty contracts.
- Provide T&M coordination for critical 3rd party software modifications as required, with concurrence of the Task Monitor.
- Respond to trouble calls & resolve problems, as needed.
- Interface with vendors. Coordinate external vendor support.
- Maintain hardware related software licenses (OS) and COTS software vendor maintenance services.
- Keep track of COTS products vendor service agreements management & renewals.
- Provide vendor maintenance and/or support agreements as required.
- Support property tracking & management.
- Provide ongoing status of procurement activities to the government task lead.
- Excess equipment marked by Task leads as quickly as possible.
- Anticipate and recommend system and procedural (hardware/software upgrades, staffing adjustments, procedure modifications, facility enhancement, etc.) changes to improve ongoing operations or increase resource or cost efficiencies.

A.6   The contractor shall provide the following Database Administration functions:

- Perform Oracle database upgrades as necessary to maintain system.
- Perform database changes as needed to implement changing requirements.
- Provide 24x7 best efforts on-call database support.
- Plan and implement database changes in support of application releases and customer requests with minimal impact to Operations. Ensure scripts provide a time stamped log to enable access to time of change, pre-change values, and post-change values and therefore an easy means of rolling back changes.
- Work with the developers in transitioning to new release in order to minimize Operational downtime and potential risks during transitions.
- For all EDOS environments (*i.e.* development, test, and operations) install Oracle software and maintain its configuration files. Create and maintain all application accounts, objects, privileges, and data (backups, archival, restores, etc.). Plan and implement backup and recovery strategy of the entire database to ensure availability and a timely database recovery.
- Provide input to developers on design concerns in database routines which may impact the operational environment. (e.g. archival and deletion of data in the database, access to large volume of data) Work toward continuous improvements with minimal performance impacts due to functional enhancements.
- Aid in planning, designing and implementing new release design changes.
- Review Oracle security and patch notifications with respect to needs of the application software. Apply patches and upgrades as approved by the project.

A.7   The contractor shall provide the following Systems/Network Administration functions:

- Provide system administration performing baseline backups and weekly backups, user account administration, and system monitoring (disk space, security, etc.).
- Manage system and network resources such as CPU usage, memory usage, disk space usage, I/O activities, processes control and network loading; monitor and tune system and network performance.
- Provide 24X7 on-call emergency support for troubleshooting system software, hardware and network problems encountered by operations, and operational transitions.
- Define and test additional network flows and firewall rules needed to implement changing requirements.
- Detect and help resolve network problems.
- Work with network engineering personnel to resolve any network or firewall problems.

- Perform operating system installations as needed to implement changing requirements.
- Evaluate security vulnerabilities that have been identified by NASA and vendors.
- Provide security vulnerability assessment responses and resolutions and identify appropriate actions to take.
- Provide engineering resources to provide ongoing IT security upgrades to mitigate security audit vulnerabilities, including installation and test of recommended security patches and kernel upgrades and to respond to data calls in a timely manner.
- Provide off-site storage for EDOS software backup media that meets C&A audit requirements and implement a procedure to periodically store backup media at the site.
- Centralize system monitoring and logging to eliminate the need to retrieve information from individual systems.
- Periodically review system logging for any suspicious or abnormal activities.
- Maintain the security and integrity of the systems and networks by developing and enforcing security procedures in accordance with NPG 2810.1 standards.
- Periodically review and update project security documents – security plan, contingency plan, and risk management plan.
- Run vulnerability-assessment tools periodically to identify security vulnerabilities or risks.
- Maintain system auditing and review auditing report to detect potential security breaches.
- Perform periodic network throughput performance measurements and retain historical data for baseline reference.
- Provide systems administration and contingency support for the SMAP Emergency Control Center hosted by ESMO.

A.8   The contractor shall provide the following Systems and Mission Engineering functions:

- Support Terra SSR Automation activities in conjunction with FOT.
- If needed, prototype CCSDS File Delivery Protocol (CFDP)/Space Link Extension (SLE) technologies for potential new mission customers
- Perform end-to-end data information systems engineering for all EDOS data flows: formats, processing steps, and data encapsulation.
- Coordinate troubleshooting between engineering and operations teams and lead root cause analyses.
- Perform systems-level technical coordination between EDOS and ▬▬▬▬▬▬▬▬▬ ;
  - .Work w/ ▬▬ to develop WAN Accelerator to support hybrid architecture
  - Work w/ ▬▬ to develop data-driven adaptive Intermediate Frequency (IF)
  - Work w/ ▬▬ to test Low Density Parity Check (LDPC) decoding bit algorithm
  - work w/ ▬▬ to provide newer FEP boards IO3100 to support 1 GB data capture rates.
- Prepare technical papers and presentations promoting EDOS accomplishments and capabilities, as requested by task monitor.
- Maintain project knowledge of EOS mission specifics and data formats, operations concepts, and problem resolution.
- Provide technical engineering, management support and outreach activities as requested by the NASA task monitor to leverage EDOS science capture and distribution capabilities for future missions.
- Promote EDOS capabilities for other organizations and future missions. Such support may include attending conferences, presenting papers, attending meetings with prospective missions, and preparing marketing materials as approved and requested by the task order monitor.
- Provide engineering support for new missions, including attending technical interchange meetings, performing studies and audits as requested, developing Memorandum of Agreements and developing ops concepts and requirements.
- Perform modeling and engineering studies to analyze EDOS network utilization and capability for future mission growth.

- Perform data analysis for CCSDS telemetry and level zero products, including detailed investigation into mission data anomalies, pre-launch test data analysis, and test data validation.
- Perform system engineering and analysis for new requirements, derivation of operational requirements for system enhancements, user interfaces, and new mission insertion.
- Ensure EDOS systems requirements (Functional & Performance Specifications) are updated as required.
- Develop and maintain EDOS ICDs as required.
- Provide systems re-engineering support for automation of all routine EDOS operator functions.
- Implement and maintain the LZPF Hybrid Architecture at all the ground stations including Trollsat and McMurdo, LZPF, and BLZPF by following a phased approach to allow EDOS to support missions from BLZPF as well as from LZPF when deployed. Continue to deploy Hybrid Architecture locally and at remote stations to provide latency improvements (BLZPF, LZPF, WSC, ASF, Norway, Wallops)
- Apply knowledge of EDOS system design and lessons learned to future enhancements, re-engineering and automation.
- Keep up to date with current trends, CCSDS standards and new technology and recommend new technology insertion where appropriate.
- Lead design efforts to modify EDOS systems architecture and maintain a strategic vision of future EDOS architecture.
- Participate in new mission thread tests and operational readiness tests for OCO-2 and SMAP.
- Provide systems administration and contingency support for the SMAP Emergency Control Center hosted by ESMO.

A.9   The contractor shall provide the following Software, Hardware and Documentation Configuration Management (CM) functions:

- Ensure that all software components which reside on development, test, operations, remote sites, and backup facility hardware strings are executing at current version level.
- Use CM tools to remove/replace software components for development and testing.
- Maintain documentation to describe software CM processes and procedures.
- Ensure Discrepancy Reports (DR)s and waivers are written to document any software changes to existing baselines.
- Ensure that all hardware/firmware equipment which comprises the development, test, operations, remote sites, and backup facility are executing at current version level.
- Use CM tools to remove/replace firmware components for development and testing.
- Maintain documentation to describe hardware CM processes and procedures.
- Ensure hardware schematics are updated to document any hardware changes to existing baselines.
- Support the Project Configuration Management Board (PCMB) by serving as the PCMB secretary which includes preparing CCR packages, draft minutes, and track action items associated with CCRs.
- Support the Discrepancy Review Board (DRB) by serving as the DRB administrator, includes assigning DRs, tracking status of DRs, preparing reports/minutes and other supporting materials as requested.
- Provide Documentation CM support by serving as the EDOS Configuration Manger, which includes backup support for EDOS through the configuration and account administration of the Mission Information & Issue Tracking System (MIITS).
- Provide analysis and impacts on DRs and Configuration Change Requests (CCRs) using the GFE automated tools as available, coordinate configuration tracking for all changes resulting from activities associated with this task with the appropriate ESMO, ESDIS, and external contacts.
- Ensure the following set of EDOS documentation remains current such as ICDs, OAs,HMP (Hardware Management Plan), DBA SOPs (Database Administrators), SA (System Administration) SOPs, SDS (Software Design Spec), SMP (Software Management Plan), EDOS Ops Concept, SW SMP, F&PS, CM PG (Configuration Management Procedures), SW Install Procedures, NASA GSFC Contingency Plan for EDOS, NASA GSFC Risk Assessment Report for EDOS.

Staff Allocation, Expertise, and Level of Effort

The Contractor shall ensure availability and competence of the work force necessary to execute the management and technical activities specified in this Task Order. The Contractor shall manage staff allocation to the required tasks described and constrained in this SOW.

Risk Management

The Contractor will apply continuous Risk Management and Best Practices compliant with NPG 7120.5X. In addition, the Contractor will comply with all Agency, Center and ESMO directives regarding Risk Management and Best Practices. Once risks are identified, the Contractor shall recommend to the GSFC/NASA government representative any changes to systems or procedures that could reduce or eliminate the risk.

The Contractor shall have a process for applying lessons learned and best practices from other NASA missions to the ESMO systems.

CMMI

The Contractor is not required to comply with CMMI requirements that are identified within the GSMO contract. The contractor is expected to adhere to best practices for software development.

Information Technology Security

The Contractor will apply Information Technology (IT) security standards based on the FIPS Publication and as defined by NPR 2810.X for systems classified as moderate systems. In addition, the Contractor will comply with all Federal Rules and Regulations and Agency/ESMO directives. EDOS is classified as a moderate system.

Configuration Management

The Contractor shall abide by the NASA ESMO Configuration Management plans and rules. The EDOS Configuration Manager will inform the NASA EDOS Project Manager of any configuration changes before the changes are implemented. The Contractor shall also write new ICDs and assist in red-lining changes to the existing ICDs and other configuration control documents as requested.

Changes in hardware and software for EDOS will be coordinated with the existing EDOS CM. All EDOS software baselines and changes to these baselines shall be stored in the software CM tool provided by NASA. Hardware CM baselines shall be tracked by periodic updates of appendix A of the EDOS Hardware Management Plan. GSMO shall use the EDOS CM and CM library for responding to CCRs and DRs and as the project repository for documents created for EDOS and EDOS configured items.

ITAR Restrictions

The contractor shall comply with any ITAR restrictions imposed by the agency regarding EDOS hardware and software when corresponding with foreign entities.

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C.   Contractor Controlled Property

The Contractor shall support designated personnel on GSMO Task Order 8 titled Hardware Sustaining Engineering and Network Security with performing property management duties which includes maintaining the list of all government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits. However no one on GSMO TO 12 should have an account or access to N-Prop.

This task order will NOT provide any desk top support. Desk top support for all ESMO task orders, including GSMO Task Order 12, will be covered under GSMO Task Order number 8 which is titled Hardware Sustaining Engineering and Network Security.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The table below lists the government provided facilities that are associated with this Task Order.

Facility	Locations
EDOS LZPF and EDOS Development and Test	B32, Rooms C210 and S9
EDOS Backup LZPF	B13, Rooms 141 and 145
EDOS GSIFs	Svalbard, Norway; Gilmore Creek, Alaska; White Sands, New Mexico; Wallops Island, Virginia; Alaska Satellite Facility, Fairbanks, Alaska; USN North Pole, Fairbanks, Alaska
EDOS DAF	White Sands, New Mexico
EDOS TrollSat/McMurdo Test Equipment	Antarctica, White Sands

The local and remote site equipment will be maintained by GSMO contractors and the support for all ESMO task orders will be covered under GSMO Task Order number 8 which is titled Hardware Sustaining Engineering and Network Security. There is no government furnished software associated with this task order.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

The contractor shall procure hardware as needed to support mission operations and new mission support.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

Specifically, the contractor shall support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
Wallops, Alaska, White Sands and Norway remote site visits are required to maintain remote equipment	Yearly
Adhoc travel to conferences, meetings, etc. to promote the multi-mission capabilities of EDOS or to provide status of EDOS system.	As needed

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	533 Reports	Monthly, Quarterly
2	EDOS Project Status Report	Monthly

3	Detailed technical schedules	Monthly
4	Budget planning data	As required
5	Technical and managerial meeting minutes, reports and presentations	As required
6	Documentation updates and/or revisions of the EDOS OAs, ICDs, F&PS, and as-built documents	As requested
7	Software, Hardware, SA and DBA documents	As needed
8	Test Reports during routine periods and daily during critical periods	As requested within two weeks of test completion

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: **13**
Modification: 4
Task Name: SDO Ground System Support
Task Period of Performance: 3/1/2012 to 4/30/2016
Modification Period of Performance: 4/1/2015 to 4/30/2016
GSMO SOW Reference: Sections 1 and 3

I.   Task Order History

Description of current modification (Modification 4): This is the fourth year task order statement of work for the SDO Ground System Support task under GSMO.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	03/01/2013	02/28/2014	Second year task order statement of work.
2	03/01/2014	04/30/2014	No cost extension
3	04/01/2014	03/31/2015	Third year task order statement of work.
4	04/01/2015	04/30/2016	Fourth year task order statement of work.

II.   Background

The Solar Dynamics Observatory (SDO) is the first solar science research mission under NASA's Living with a Star Program. The Observatory was successfully launched in February 2010 and is now in its routine science operations phase. Lead mission operations responsibility resides with the Space Science Mission Operations (SSMO) Project Office at Goddard Space Flight Center (GSFC), Code 444.

This SOW addresses the Flight Operations services required of the Ground Systems and Mission Operations (GSMO) contractor in support of the NASA SDO Mission Director (MD). These services include ongoing Operations Engineering support for the SDO Ground System; staffing and operations of the Mission Operations Center (MOC); and health and safety and command control of the observatory. Additionally, the contractor shall support task order management, staffing, cost analysis, and reporting activities as required by the MD and the SSMO Project Office.

III.   Scope of Work

The Contractor shall perform all technical and managerial work required to ensure successful support for and operations of the SDO satellite and the SDO Ground System, as detailed below.

A.   Requirements

A.1.   The contractor shall support the Ground System Configuration Control Board (CCB) process, maintain the Mission Operations Change Request (MOCR) database, and provide MOCR technical review and impact assessments as needed.
A.2.   The contractor shall maintain and update Interface Control Documents as necessary.

A.3.   The contractor shall provide support to the MD in the generation of technical presentation packages as required. Provide technical review of Project documents as applicable to GS and/or operations.

A.4.   The contractor shall assist the SDO Mission Director in maintaining the operations configuration of all primary MOC functions and subsystems including:

- a.   Real-time Telemetry and Command (T&C) System
- b.   Mission Planning System (MPS)
- c.   Integrated Trending and Plotting System (ITPS)
- d.   Flight Dynamics System (FDS)
- e.   SDOGS and DDS Monitor and Control Functions
- f.   Alert Notification System (ANS)
- g.   MOC Automation Systems
- h.   MOC Time Display System
- i.   Internal File Server (IFS)
- j.   DMZ Product server
- k.   Mini-MOC (located at WSC)

A.5.   The contractor shall develop and maintain scripts and procedures as needed to support MOC automation functions.

A.6.   The contractor shall support the SSMO configuration management process for ground system software releases, and data products.

A.7.   The contractor shall maintain Science Data Accounting tools and processes.

A.8.   The contractor shall maintain the MOC 'lights-out' automation software and hardware tools and processes including the ANS paging system, remote access to the MOC DMZ, and maintaining service accounts for mobile two-way text messaging capabilities with internet and/or wireless service providers.

A.9.   The contractor shall support acceptance and regression testing of all MOC software patches.

A.10.   The contractor shall support the MD in maintaining the GMSEC architecture in the MOC design.

A.11.   The contractor shall perform updates, validation, configuration control, and distribution of the SDO Project Database (PDB). Perform the Lead PDB Administrator role for coordinating formal SDO PDB releases.

A.12.   The contractor shall maintain the MOC Maintenance Manual

A.13.   The contractor shall provide training of the FOT on MOC system operations as appropriate.

A.14.   The contractor shall support the SDO Flight Software Configuration Control Board (CCB), GSFC Code 582, and provide CCR technical review and impact assessments as needed.

A.15.   The contractor shall provide general MOC facility support to include running of network and power cables, repair of raised floor tiles, and other basic facility maintenance/repair support.

A.16.   The contractor shall perform System Administration (SA) and Configuration Management (CM) duties of the MOC hardware, software, databases, network, mission and other operations data.

A.17.   The contractor shall provide Lead System Administrator support of all MOC computer systems, SDOGS Range Receive Command Processors (RRCPs), and the DDS. This effort includes establishing user accounts, performing system backups, performing ground system firewall rule coordination with IP-NOC, installing applications software, and maintaining the required patch level of the operating systems on Linux, Windows, and Mac OSX platforms.

A.18.   The contractor shall install, configure, and maintain MOC hardware including computer systems, servers, RAIDs, KVM switches, network switches and routers, printers, etc.

A.19.   The contractors shall maintain all operations products required for Flight Operations including STOL procedures, display pages, stored command load templates, and Local Operating Procedures (LOPs) for normal, L&EO, and contingency operations.

A.20.   The contractors shall maintain the ASIST database required to monitor and control the SDOGS and DDS systems.

A.21.   The contractors shall perform user acceptance and regression testing of the MOC, SDOGS, and DDS systems as needed.

A.22.   The contractors shall maintain SDOGS and DDS Local Operating Procedures.

A.23.   The contractors shall update and maintain FOT training and certification material as needed.

A.24.   The contractors shall operate and maintain all SDO ground systems as required to meet mission objectives. This includes operation of all MOC T&C Systems, MPS, FDS, ITPS, PSS, and ANS subsystems; operation of the two SDO Ground Stations (SDOGS); and operation of the Data Distribution System (DDS) for both normal and contingency operations.

A.25.   The contractors shall plan and execute daily operations as per the SDO Flight Operations Plan.

A.26.   The contractors shall maintain Configuration Management over all operations products including the T&C Database, Display Page Definitions, STOL Procedures, LOPs, and baseline configuration files for the MOC subsystems.

A.27.   The contractors shall document all space and ground segment anomalies and coordinate anomaly resolution with the NASA Mission Director (MD) and AETD Spacecraft Engineers as appropriate.

A.28.   The contractors shall provide System Administration of all MOC subsystems including the T&C Systems, MPS, FDS, ITPS, and ANS subsystems.

A.29.   The contractors shall provide System Administration of the DDS and support SA of the SDOGS

A.30.   The contractors shall staff the MOC Monday thru Friday from 8:00 AM to 8:00 PM (EST).

A.31.   The contractors shall provide on-call FOT support to cover off-hours and weekends.

A.32.   The contractors shall generate, uplink, and verify spacecraft commands as needed to carry out the daily operations plan and to maximize science data return.

A.33.   The contractors shall monitor and maintain the health and safety of the SDO housekeeping systems.

A.34.   The contractors shall detect and respond to observatory anomalies as per approved contingency plans and return the observatory to a state of normal operations in a timely and safe manner.

A.35.   The contractors shall compile periodic spacecraft trending reports to include key telemetry for all major spacecraft subsystems and instruments. The contractor shall make note of all instances of limit violations and out of specification behavior. The reports shall be compiled on weekly and quarterly bases. The reports will be reviewed by Project and cognizant AETD personnel.

A.36.   The contractors shall identify obsolete or likely to soon become obsolete hardware or software components of the SDO Ground System, including SDO Project GSE, and shall notify the MD of the identified need for replacement of these items in a timely manner.

A.37.   The contractors shall work with the MD and AETD Engineers as appropriate to develop technology refresh plans for identified obsolete hardware or software items, and

will support the development and implementation of these technology refresh plans as needed.

A.38.   The contractors shall coordinate security audits on a periodic basis of all installed SDO Ground System hardware and facilities, including SOCs.

A.39.   The contractors shall maintain applications designed to manage and perform routine IT security tasks such as monitoring of MOC system logs and error/audit reports.

A.40.   The contractors shall maintain procedures in accordance with the security plan for managing user accounts, backing up data, and configuring systems.

A.41.   The contractors shall ensure that systems are kept up to date with latest security patches in accordance with GSFC Code 400/700 direction.

A.42.   The contractor shall ensure the availability and competence of the work force necessary to execute the management and technical activities of this Task Order.

A.43.   The contractor shall manage staff allocation to the required tasks specified.

A.44.   The contractor shall supply all anticipated personnel training requirements (both dates and costs) and any associated ODC costs anticipated during this period of performance.

A.45.   The contractor shall work with the MD, Science Teams, and AETD Engineers as appropriate to develop maintenance plans to maintain SDO Project GSE hardware including components of the SDO Flight Software Laboratory, SDO Spacecraft Simulator GSE, and all of the SDOGS GSE at White Sands. The contractor shall provide these plans to the MD for review and concurrence, and to the appropriate hardware custodians for implementation. The contractor shall monitor the implementation and performance of the plans and shall report the status to the MD. The contractor shall advise the MD when GSE units need to be transported to GSFC for servicing by the contractor.

A.46.   The contractor shall provide support for the effort to test and implement the Data Access Tool trending utility for SDO.

A.47.   The contractor shall provide support for the effort to test and implement the Dashboard monitoring system for SDO.

A.48.   The contractor shall complete the technical paper on the topic: "Analysis of Gyroless ACS modes for SDO to Mitigate Potential IRU Failure", and shall travel to present the paper and attend the conference. This is a mission critical activity.

A.49.   The contractor shall perform all analysis necessary for Flight Dynamics Support of SDO, including monitoring the health and integrity of the ACS and ground FDS system, planning and performing null momentum bias applications and removals, momentum unload maneuvers, station-keeping maneuvers, and eventual spacecraft disposal maneuvers.

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV.   Government Furnished Facilities, Equipment, Software, and Other Resources

A.   Office Space

All personnel supporting this task order shall utilize government-furnished office space. This shall include office furnishings, telephone, desktop computer hardware and software resources, and internet access.

B.   MOC Computer Systems and Peripherals

All computer systems that comprise the MOC subsystems and associated peripheral equipment will be government furnished. This includes all hardware associated with the MOC T&C System, MPS, ITPS, ANS, FDS, IFS, servers, printers, and data storage and backup systems. The GSMO contractor shall provide property management of these systems.

C.   MOC Software

All computer systems that comprise the MOC subsystems and associated peripheral equipment will be government furnished. This includes all hardware associated with the MOC T&C System, MPS, ITPS, ANS, FDS, IFS, servers, printers, and data storage and backup systems. The GSMO contractor shall provide property management of these systems.

V.   Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

Specifically, the contractor shall support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
Science Operations Centers for IT Security Compliance Activities	As Needed
Attend Technical Conference to present Technical Paper on Analysis of Gyroless ACS modes for SDO to Mitigate Potential IRU Failure	Per final conference schedule.
White Sands, New Mexico for annual on-site mini-MOC test	November-December 2015

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Updates to the ANS per approved Configuration Change Requests	As Needed
2	Weekly SDO Operations Status Report	Every Wednesday
3	Quarterly Planning Meeting Reports	On Wednesday Following Quarterly
4	Real-Time Operations Certifications for FOT New Hires	As Applicable
5	Weekly and Quarterly Spacecraft Status Reports Including Subsystem Trending	Reported Weekly and by One Month after Each Quarter
6	Mission Operations CCB	As Needed
7	Weekly Operations Planning Meeting	Every Tuesday
8	Weekly Science Data Accounting Report	Every Tuesday
9	Monthly Science Data Accounting Report	Monthly by the 5th
10	Science Operations Activity Report (.sxc file)	Monthly by the 5th

End of Task Order Statement of Work

Ground Systems & Mission Operations (GSMO)
Task Order
Statement of Work (SOW)

TO: NNG11VM00C   14/6
Mod: 6
Task: Test Conductor Support for MMS Integration and Test Activities
Task Period of Performance: 03/01/2012 - 03/31/2015
Modification Period of Performance: 10/20/2014 - 03/31/2015
GSMO SOW Reference: 2.4

Description of current modification (Modification 6): This modification extends the task order thru March of 2015. It also adds scope to provide Test Conductor (TC) support at Kennedy Space Center (KSC) to support launch operations.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	08/01/2012	02/28/2013	Staffing of additional Test Conductors to support Integration and Test activities for MMS Observatories-2 and -3.
2	08/01/2012	02/28/2013	Added scope for international travel
3	03/01/2013	02/28/2014	Added scope for Instrument Suite TC Support, add system administration support, and add additional I&T support tasks.
4	04/27/2013	02/28/2014	Replan
5	03/01/2014	02/28/2015	Added scope for launch site operations, deleted System Admin support.
6	10/20/2014	3/31/2015	Extend launch site operations.

I.   Background:

The Magnetospheric Multi-scale (MMS) mission is a Solar Terrestrial Probe mission comprising four identically instrumented spacecraft that will use Earth's magnetosphere as a laboratory to study the microphysics of three fundamental plasma processes; magnetic reconnection, energetic particle acceleration, and turbulence. These processes occur in all astrophysical plasma systems but can be studied in situ only in our solar system and most efficiently only in Earth's magnetosphere, where they control the dynamics of the geospace environment and play and important role in the processes known as "space weather".

The Integration and Test (I&T) effort begins with the integration of the components on the MMS FlatSat test-bed and continues through launch. FlatSat is the engineering test bed for the flight hardware and software development. Integration and test at FlatSat is the first step in the observatory I&T process. The I&T effort includes integration of each component and testing of the component in the observatory system. Once the observatory has been integrated and functionally tested, it will be tested through various mission environments to verify operation.

I&T also includes launch site operations required to get the observatories ready for launch.

II. Management Approach

The Contractor shall create and maintain a Task Plan that describes the manner in which the Contractor will manage the work for each of the elements identified. The task plan will identify major milestones, and resource allocations.

Management responsibility will at a minimum include the following areas:

A. Staff Allocation, Expertise, and Level of Effort

The contractor shall ensure the availability and competence of the work force necessary to execute the management and technical activities of this Task Order. The contractor shall manage staff allocation to the required tasks specified. Lab support personnel will be current with training in accordance with NASA-STD-8739.7 and any other training required supporting the lab environments at GSFC.

B. Management Reporting

The Contractor shall provide a monthly status report to the Task Monitor (TM) that tracks technical, cost, and schedule performance versus plans for each of the major subtasks identified, showing milestones as appropriate. The report should also include any risks (technical, cost, or schedule) identified.

C. Configuration Management

The Contractor shall support the Configuration Management (CM) policies and procedures established by the MMS Program Office.

D. Operations Facilities

The Contractor shall perform a majority of the work specified in this SOW at GSFC. Some environmental testing may be performed at facilities external to GSFC including the Navy Research Lab (NRL). Travel to these locations may be required to support I&T testing. In addition, travel to and work at KSC will be required during this period of performance to support MMS launch operations.

E. Information Technology Security

The Contractor shall perform the work specified in this SOW in compliance with the security procedures established by the MMS Project Office.

III. Technical Approach
A. Requirements

The Contractor shall provide engineering support services in support of the MMS FlatSat development and avionics development effort. This shall include:

- Development and review of test plans and procedures, observatory instrumentation, and ground system test tools required to develop and validate the project data base for satellite integration and test and mission operations

- Provide technical support to the spacecraft and instrument teams for interface verification to the MMS ground system
- Provide technical at GSFC in the areas of ground support equipment (GSE) operation, project database maintenance and update, and test procedure development

The Contractor shall support the MMS Mission Operations Manager in the following areas:

- Spacecraft to Ground System telemetry and command interface definition
- Technical review of Mission Operations Concepts
- Planning support for Mission Simulations and testing with the observatories from the MOC
- Implementation of plans by creation of procedures for use with the flight systems

The Contractor shall support the MMS Integration and Test Manager in the following areas:

- Planning and execution of integration and test of MMS Spacecraft.
- Support for the development and execution of STOL procedures for operating and testing the MMS observatories during performance acceptance and environmental testing at GSFC.
- Provide staffing support for observatory level integration and test activities including development of procedures and displays needed to execute functional tests, the Comprehensive Performance Test (CPT) as well as any special test configurations identified by the MMS PDLs and systems engineers.
- NASA IT Security Compliance for the MMS I&T Facility. IT security support shall be limited to the ground support systems located in the MMS I&T Facilities located in building-29 room 160, building-7 room 172, and MMS GSE located at NRL in support of observatory thermal vacuum testing.
- Maintain the I&T hardware configuration file.
- Provide maintenance support for the TRACS system and I&T Website.
- Provide support to systems team and project office to develop engineering and tracking tools.

B. Travel

The Contractor may be required to travel in support of any I&T related meetings, deliveries of GSE, testing, etc.

- Planned observatory thermal vacuum testing at the Naval Research Lab (NRL) facility in Washington, DC.
- International travel may be required for TCs supporting the IS.
- Travel to KSC/Astrotech, Titusville, FL for Launch Operations support.
  - 21 trips for 7days each. (▬▬)
  - 5 trips for 7 days each (▬)
  - 5 trips for 7 days each (▬)

C. Organizational Interfaces

The Contractor is required to interface with several elements within the MMS Project during the execution of this task order. These elements include:

1) MMS Observatory Manager, GSFC Code 461
2) MMS Ground System Manager, GSFC Code 581
3) MMS Mission Systems Engineer, Code 599
4) Integration and Test Manager, Code 568

Technical direction on this task will be from the Integration and Test Manager or designate. The Task Monitor for this task will be the Integration and Test Manager.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

Office space for contractor staff assigned to support this task order will be Government furnished on-site at GSFC.

V. Deliverables

Deliverables and other significant milestones for this task order are as follow:

1) Updates to the Project Database (command and telemetry RDL source files) to support the MOC and Observatory I&T: as needed
2) Revisions to of STOL procedures to support Functional and CPT: as needed
3) Weekly report delivered via email by no later than COB Monday each week.

GSMO TASK ORDER

Task No: **#15**
Modification: 6
Task Name: LRO Ground Systems Modernization
Task Period of Performance: 1 Mar 12 to 30 Sep 14
Modification Period of Performance: 1 Mar 14 to 30 Sep 14
GSMO SOW Reference: Section 2, 2.3

I.   Task Order History

Description of current modification (Modification 5): This is the task order statement of work for LRO Mission Operations Hardware Refresh.

Mod #	Start	End	Brief Description
0	03/01/2012	09/30/2012	Initial task order statement of work.
1	03/01/2012	09/30/2012	Administrative Modification
2	10/01/2012	05/31/2013	Task order extension statement of work
3	06/01/13	08/31/13	Task order no-cost extension
4	06/01/13	08/31/13	Administrative Modification
5	09/01/13	02/28/14	Task order extension statement of work
6	03/01/14	09/30/14	Task order extension statement of work

II.   Background

Launched in June, 2009, the Lunar Reconnaissance Orbiter (LRO) mission completed its initial one-year exploration mission in September, 2010, at which time a two-year science mission began. At the end of September, 2012, the originally proposed science mission was completed and a two-year science mission extension was approved until the end of September, 2014. A second two-year science mission extension is anticipated through September, 2016.

This task order authorizes the contractor to upgrade the mission operations hardware to support the LRO mission. Technical Direction will be provided by the Mission Director as assigned by the Mission Operations and Validation Branch. The LRO Mission Operations hardware refresh will be primarily performed at the LRO Mission Operations Center (MOC) in Building 32 at Goddard Space Flight Center. Selected hardware will be refreshed, as necessary, at the WS1 antenna complex in White Sands, NM; the USN station at Dongara, Australia; and the bMOC in Horsham, PA. A back-up mission operations center is located in conjunction with the Universal Space Network facility in Horsham, PA. The assigned Contractor will interface, as necessary, with the SSMO Project, LRO Project Science Team, NISN, Flight Dynamics Facility, GSFC Code 450, JPL/DSN, and each of the individual Instrument Science Operations Centers (SOCs).

III.   Scope of Work

The Contractor shall provide all operations and engineering support required to perform "proof of concept" design to upgrade and improve MOC hardware, internal networks, and other systems under the control of the Mission Operations Team (MOT) as directed by the LRO Mission Director or the SSMO Project Manager. Following successful demonstration of the PoC, the contractor shall proceed with full implementation of the proposed MOC modernization.

1

A.   Requirements

A.1.   The contractor shall complete the Virtual Machine (VM) Proof of Concept (POC) integration, configuration, and testing.

A.2.   The contractor shall present a POC Readiness Review (POCRR) at the completion of POC testing. The POCRR will contain full architecture description, test procedures, and test results.

A.3.   Upon SSMO Project approval at the POCRR, the contractor shall procure, install, configure, and test all necessary equipment and interfaces to implement a fully operational VM MOC system.

A.4.   The contractor shall present an Operations Readiness Review (ORR) at the completion of the VM MOC system.

A.5.   Upon SSMO Project approval at the ORR, the contractor shall make the VM MOC system operational.

A.6.   The contractor shall configure, ship, install, and test an upgraded Data Processing System (DPS) at the WS1 antenna complex in White Sands, NM.

A.7.   The contractor shall perform an IT Security self assessment and update the Subsystem Acceptance and Implementation Variances (SAIV), Risk Assessment, Contingency Plan for the upgraded LRO MOC system and IONet security forms.

A.8.   There are no Capability Maturity Model Integration (CMMI) software development requirements in this task order.

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor. In addition, the Contractor shall provide a weekly report by the close of business each Wednesday. The weekly report will include a status of all activities during the preceding week.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV.   Government Furnished Facilities, Equipment, Software, and Other Resources

Not Applicable

V.   Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order. The Task Monitor shall concur with the materials list prior to procurement.

VI.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

VII.   Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Weekly Report	COB Wednesday each week
2	Operations Readiness Review (ORR)	At completion of VM testing
3	Test Reports	At the completion of POC, VM MOC, and DPS testing
4	IT Security: Subsystem Acceptance and Implementation Variances (SAIV), Risk Assessment and Contingency Plan for the upgraded LRO MOC system and IONet security forms.	At completion of MOC modernization
5	Final Status Report: Final status of all work and deliverables	At completion of MOC modernization

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: **16**
Modification: 7
Task Name: LCRD Systems Engineering Support
Task Period of Performance: 3/1/2012 - 5/31/2016
Modification Period of Performance: 7/1/2015 - 5/31/2016
GSMO SOW Reference: 2.1

I.   Task Order History

Description of modification (Modification 7): This task order statement of work provides general systems engineering, project management, and Information Technology (IT) Security support to the Laser Communications Relay Demonstration (LCRD) project. Modification 6 added sub task 3 for IT Security and extended the period of performance to 5/31/2016. Modification 7 adds a subtask for ground system engineering support.

Mod #	Start	End	Brief Description
0	3/1/2012	2/28/2013	Initial task order statement of work.
1	8/1/2012	2/28/2013	Replan modification from vendor reducing cost plan needed to support task requirements.
2	3/1/2013	2/28/2014	One-year extension to task.
3	1/1/2014	9/30/2014	Provide cost reduction strategies for the Lasercom Technology and Architecture Support and extend period of performance through 9/30/2014.
4	8/1/2014	7/31/2015	Stop all support to the Lunar Laser Comm Demonstration (LLCD) and Provide support for the Laser Communication and Relay Demonstration Project (LCRD), and extend period of performance through ~~9/30/2015~~ 7/31/2015.
5			Administrative Modification
6	6/1/2015	5/31/2016	Add I&T IT Security Scope see Section A. 5 below.
7	7/1/2015	5/31/2016	Add Ground System Engineering support subtask.

II.　Background

Provide general systems engineering, project management, and IT Security support to the Laser Communication and Relay Demonstration Project under the Explorations Space Communications Project Division with direct support from the Project Manager.

III.　Scope of Work

The Contractor shall Project Management Support, Systems Engineering Support, Lasercom Technology and Architecture Support, and IT Security Support for the LCRD Project. See details below:

A.　Requirements

1. The contractor shall provide Project Management Support
    i. Project and technical risk assessments and risk management
    ii. Project planning and acquisition planning;
    iii. Support LCRD monthly reviews, status briefings, and other programmatic activities;
    iv. Maintain project documents, such as the LCRD Project Management Plan
2. The contractor shall provide Systems Engineering Support
    i. Develop, refine, and review LCRD functional and performance requirements
    ii. Interface requirements development, management, and implementation to include:
        a) LCRD Space-to-ground ICD
        b) Payload unit ICDs
        c) Payload-to-spacecraft IRD and ICD
    iii. Support development and refinement of LCRD Concept of Operations (ConOps)
    iv. Organize, prepare, and present content for LCRD milestone reviews and Engineering Peer Reviews and support project activities in response to formal actions (RFAs).
    v. Assess and maintain project compliance with GSFC 7123.1 systems engineering processes including GSFC GOLD Rules.
    vi. Monitor and support LCRD technical trade studies across the project
    vii. Support LCRD optical communication working group activities including link budget analysis
    viii. Provide payload mechanical systems engineering support as necessary
    ix. Support development of LCRD integration and test plans and activities
    x. Support stakeholder engagement activities:
        a) Space Communications and Navigation (SCaN) and Office of Chief Technologist (OCT) activities as required (such as ISS LEO terminal studies and lasercom commercialization efforts)
3. The contractor shall provide Lasercom Technology and Architecture Support
    i. Support lasercom advocacy and strategic communications activities
    ii. Support SCaN and OCT lasercom architecture and implementation activities, as required.
    iii. Support investigation of lasercom applicability and flight opportunities for NASA missions

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4. The contractor shall implement Organization Conflict of Interest (OCI) Mitigation Plan and sign a Non-Disclosure Agreement due to potential conflict of interest regarding LCRD support.

5. The contractor shall provide Integration and Test (I&T) IT Security support throughout the IT Security System Development Life Cycle (SDLC) of those assets and information within the LCRD authorization boundary. Support includes:

    i. Complete information categorization and validation with tailoring as appropriate
    ii. Perform selection, scoping and implementation of appropriate IT Security controls
    iii. Perform recurring assessment and update of IT Security control implementations to comply with continuous monitoring requirements
    iv. Provide input for the Project Security Plan (required by NPR 7120.5), System Security Plan (SSP), Risk Assessment Report (RAR) and Contingency Plan (CP)
    v. Coordinating IT Security documentation management and FISMA reporting within the NASA Security Assessment and Authorization Repository (NSAAR)
    vi. Develop artifacts and support interviews and System Test and Evaluations (STE) for annual, third-party assessments.

6. The contractor shall provide Ground Systems Engineering support for space and ground segment system engineering, data processing, real-time on-orbit operations and monitoring, spacecraft command/control, telemetry procedure development, data base development/maintenance, space systems communications, software test/command script development, training and operations procedure development. This support shall include:
    i. Mission systems I&T between various network elements
    ii. Participation in the development and verification of ground segment architecture and operations plans and procedures. Assist the project in proactively identifying, analyzing, resolving, and managing risks in current and future ground segment architecture and operations. Participation in the operational validation of the ground segment, including interface tests, end-to-end tests and mission simulations.
    iii. Resolution and prevention of facility and operational anomalies and mitigate potential risks.
    iv. Providing oversight of the ground system contractors to ensure adherence to project requirements.
    v. Support various system reviews, engineering peer reviews, and specific hardware and software reviews on the Implementation contractor approach and design.

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    vi.   Provide focused technical insight to assist the LCRD Technical Manager in monitoring contractor performance in the design, fabrication, and test of ground equipment. Analyze the performance to determine compliance with NASA specifications and provide written results of the analysis. Support includes implementation monitoring, test procedure review, test witnessing, test results analysis.

    vii.   Review and evaluate schedule progress each month after delivery of IMS from the LCRD implementation activities. Evaluation and observations should be provided to the LCRD Technical manager.

    viii.   Evaluate trades and technical memos generated by the implementation contract in the ground systems network area.

    ix.   Evaluate COTS SW and HW selection and technologies being planned by the implementation contractor(s).

    x.   Provide Development Integration Engineering Support. This effort will focus on planning for and supporting monitoring of integration and testing activities. The support will include reviewing integration and test procedures, reviewing test processes, defects handling, and verification activities. The position will also include reviewing test schedules and providing feedback to the LCRD project development manager and supporting the LCRD Risk Management Process

B. Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The Government will provide a printer, and a standard laptop, docking stations, and monitor which will come with the standard Microsoft software as well as Microsoft project for the supporting Senior Systems Engineers. However, the Project Management supporting Systems Engineer is not provided Government furnished property.

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V.   Material Procurement

There are no requirements for the Contractor to provide material procurement under this task.

VI.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

Specifically, the contractor shall support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
• Trips to SSL (host spacecraft vendor) 1-2 days per month every other month to support technical interchange meetings and reviews	Quarterly

Travel is not required for Subtask I&T IT Security.
Travel for the Ground System Engineering support is described in the table below:

Travel Description	Approximate Time Frame
• Trips to SSL (host spacecraft vendor) 3 days to support technical interchange meetings and reviews	Quarterly

VII.   Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Monthly Status Report (can be only 533 cost report)	15th of each month

End of Task Order Statement of Work

GSMO TASK ORDER

Task No:	**17**
Modification:	5
Task Name:	GMSEC Mission Systems Engineering and Configuration Support
Task Period of Performance:	12/01/2014 to 11/30/2015
Modification Period of Performance:	4/15/2015 to 11/30/2015
GSMO SOW Reference:	2.1: Mission Operations Development – Systems Engineering
	2.2: Mission Operations Development – Engineering Studies
	2.3.1: Mission Operations Development – Development – Facility Engineering

I.   Task Order History

Description of current modification (Modification 5): Modification 5 to the statement of work for the Goddard Mission Service Evolution Center (GMSEC) Mission Systems Engineering and Configuration Support task. The purpose of this modification is to add two subtasks to the task.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	03/01/2013	2/28/2014	Modification 1 to statement of work to extend task end date
2	03/01/2014	11/30/2014	Modification 2 to the statement of work to end task end date
3	03/01/2014	11/30/2014	Modification to include a requirement for classified support.
4	12/01/2014	11/30/2015	Modification 4 to statement of work to extend task end date
5	04/15/2015	11/30/2015	Modification to add two subtasks to the task

II.   Background

The Goddard Mission Services Evolution Center (GMSEC) is an integrated effort across multiple GSFC organizations to provide GSFC mission services. GMSEC provides mission enabling, cost and risk reducing data system solutions applicable to current and future missions managed by GSFC. GMSEC will enable the continued recognition of GSFC as a leader in space mission expertise and services.

Under this task, the contractor shall provide technical services, including documentation, demonstration concept development, requirements definition, and lab use plans.

Work under this task requires SECRET clearances for specific individuals due to GMSEC coordination/consultation with other government agencies.

The work associated with this Task Order is supported through multiple funding sources. For this reason, the work and financial reporting should be divided per the following subtasks:

Subtask 1: General GMSEC support

Subtask 2: GMSEC support for the Space Geodesy Project (SGP) project

III.   Scope of Work

The Contractor shall provide Mission System Engineering support services for the development of mission operations concepts and interfaces in support of GMSEC. The work to be performed shall be monitored by the NASA GSFC GMSEC Deputy Project Manager.   Regular meetings and other methods shall be used to maintain communications with the GMSEC software engineering team keeping them apprised of new concepts, architectures, and lab use plans.

A.   Requirements

General – Applicable to all subtasks

A.1.   ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯ This involves providing guidance about the advancement of the GSFC ground system software system capabilities. Also included is the development of requirements for new products, recommendation and prioritization of new concepts, identifying existing mission-developed tools or software from other Centers that should be considered for update to become GSFC mission-generic tools. Act as a mission customer and test group to the GMSEC software engineering team.

Subtask 1 - General GMSEC support

A.2.   The contractor shall act as a Mission Liaison and GMSEC Advocate. This involves working with current and planned GSFC missions keeping them apprised of GMSEC status and plans, to learn of needs that can be met by GMSEC, to identify future needs, etc. This includes helping field some of the external requests the GMSEC team gets for further GMSEC-related information.

A.3.   The contractor shall provide GMSEC Demonstration Lab Engineering Support. This includes:
- Lab configuration design: includes support of general Lab use, vision, and design. Does not to include system administration, building facilities responsibilities, lab management or property management.
- System architecture support: includes allocation of functions to processors, virtualization plan, video system management, etc. Support is available from GMSEC System Administrators and Software team to actually configure systems.
- Mission scenario demonstration support including concept, design, and presentation for mission realism.

Subtask 2- GMSEC support for the SGP project

A.4.   The contractor shall provide software systems engineering support that will assist in the definition of the network-based operations system requirements and architecture for SGP.

A.5.   Understand how the legacy network is currently operated, including the GGAO experience, and what was done with GMSEC.
   a. Summarize the operations concept, including that of all four geodetic techniques. Identify whether there is any concept that currently integrates the operation of at least two of them (not likely).
   b. Incorporate the operational experience gained through the Goddard Geophysical and Astronomical Observatory (GGAO), which is SGP's prototype site.
   c. Review Results of GMSEC's demonstration in September 2014.

A.6.   The contractor shall provide a survey of existing SGP software tools for SLR and VLBI to:

    a.   Document what they do and don't do

    b.   Document their interfaces

    c.   Capture their operation concepts and requirements

    d.   Capture their functionality

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV.   Government Furnished Facilities, Equipment, Software, and Other Resources

There are no Government furnished facilities, equipment, or software associated with this Task Order.

V.   Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

Specifically, the contractor may have to support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
SpaceOps 2014	May 2014

VII.   Deliverables

The Contractor shall provide the following deliverables in support of Subtask 1 - General GMSEC support:

ID	Deliverable Description	Due Date
1	Monthly Idea Report	Monthly
2	Bi-weekly status report including mission contacts	Bi-weekly
3	Support to the GMSEC Software Engineering Team	Through the period of performance
4	Product Demonstration Plan	April 2012
5	Mission Operations Training Plan	April 2012
6	Mission-like Demonstration Plan	Initial April 2012, updated for each unique mission demonstration
7	Data Access Toolkit Independent Testing	September 2012
8	DAT Test Plan	As required for each delivery
9	DAT Test Procedures	As required for each delivery
10	DAT Test Report	As required for each delivery
11	Quarterly Status Presentation	Late January, April, July, and September
12	Monthly Status Presentation the GMSEC Software Engineering Team	Every 4 weeks
13	System Engineering Studies	Quarterly, as assigned
14	Mini-Moc / Spacecube Demonstraton	May 2014
15	Mini-Moc expansion plans	June 2014
16	Mini-Moc updated demo	Oct 2014
17	GMSEC mission users quad charts	Monthly, as assigned
18	Current State of Mission Automation paper	January 2015
19	Mini-MOC cloud demonstration	March 2015
20	Additions to GMSEC virtualization infrastructure	June 2015

The Contractor shall provide the following deliverables in support of Subtask 2 - GMSEC support for the SGP project

ID	Deliverable Description	Due Date
1	Contractor completes survey of existing tool. This documents existing SLR & VLBI system requirements, tools, operations, interfaces, and functionality. Survey should also include an understanding of how the legacy network is currently operated, including the GGAO experience, and what was done with GMSEC.	4/29/15
3	Contractor expands on current architecture concept	6/17/15

	for the Space Geodesy Core Network architecture based on deliverable #1.	
2	Contractor assist the Government (Code 580) in refinement of requirements (including level 4 & 5) for the Space Geodesy Core Network architecture	7/15/15
4	Contractor provides assistance to the Government (Code 580) in writing the final report.	8/12/15

End of Task Order Statement of Work

Ground Systems and Mission Operations (GSMO)
TASK ORDER

Task No: 18
Modification: 6
Task Name: Laser Communication Relay Demonstration
                                                (LCRD) Integration and Test, Ground System
                                                Engineering Support Task
SOW Period of Performance: 3/1/2012 – 9/30/2015
Modification Period of Performance: 1/8/2015 – 9/30/2015
GSMO SOW Reference: 2.1, 2.2.

I.   Task Order History

Description of current modification (Modification 6): Addition of travel requriements to
Disruption-Tolerant Networking (DTN) sub-task

Mod #	Start	End	Brief Description
2	12/1/2013	9/30/2014	Extension of Task to cover LLCD Extended Mission in March 2014, followed by Closeout with Lessons Learned transferred to LCRD and also completion of DTN software.
3	8/22/2014	9/30/2014	Administrative change, Task Monitor from Donald Cornwell to Robert Patschke
4	10/1/2014	9/30/2015	Extension of task and modification to support LCRD component, Payload, mission I&T, and operations.
5	11/1/2014	9/30/2015	Modification to include DTN Project support
6	1/8/2015	9/30/2015	Addition of contractor travel requirements for DTN sub-task.

II.   Background

This task was originally constructed for the LADEE Lunar Laser Communication Demonstration
(LLCD) Mission which completed flight operations in March 2014. The Laser Communication
Relay Demonstration (LCRD) is the follow-on demonstration mission for a 2 year space to
ground optical communications demonstration. The main objective is to characterize the space to
ground optical links, including influences from atmospheric effects. LCRD's launch date is
December 2018.

The NASA Integrated Test and Operations System (ITOS) will be the command and control of
flight and ground segment assets during the ground I&T and mission operations phases. The
NASA Goddard Space Flight Center (GSFC) will host the LCRD Mission Operations Center
(LMOC), and the Jet Propulsion Laboratory (JPL) also utilizes the ITOS platforms for Monitor

and Control (MCSubsystem) at Ground Station-1. This task order shall ensure compatibility and standardization between all the flight and ground subsystem developments (L5) that utilize ITOS, such that minimum effort will be required to translate I&T products (scripts/pages/tools) at the next level of assembly during Payload Comprehensive Performance Testing (CPT), Ground Segment Readiness Tests (GRT's), Mission Readiness Tests (MRT's), Mission Operations Simulations, and Mission Operations.

ITOS systems support the LCRD Product Design Leads (PDL's), test conductors, experiment teams for managing and distributing mission/experiment data to the appropriate end user for analysis and trending.

An expected key LCRD experiment will be the test and demonstration of Disruption-Tolerant Networking (DTN). As part of a multi-center DTN Project, GSFC is leading the development and implementation of tools for DTN Network Management.

III. Scope of Work

In preparing for LCRD I&T, and under this task, the contractor shall provide technical services to the LCRD Project, including:

- ITOS ground system software support to LCRD component laboratories and Payload I&T facilities. Support software configurations and recommend standards for user utilization of the ITOS functions. Support definitions for naming conventions, directory structure, logs, trending, and compatibility between the Payload and ground systems. Provide training to test conductors on the use of these.

The level of effort for this sub-task shall not exceed 0.3WYE for the period of performance 9/20/1 to 9/30/15. The work shall be monitored by the GSFC LCRD Task Monitor. Bi-weekly teleconferences and technical e-correspondence shall be used to maintain communications.

In preparing for LCRD experimentation, and under this task, the contractor shall provide technical services to the DTN Project, including:

- Development of software tools for the management of DTN networks.
- Execution of demonstrations of tools.
- Participation in standards development
- Documentation and training of DTN NM tools
Travel to attend DTN NM meetings with end users and co-developers

The level of effort for this sub-task shall not exceed 0.5WYE for the period of performance from 11/1/14 to 9/30/15. The work shall be monitored by the GSFC LCRD Task Monitor. Bi-weekly teleconferences and technical e-correspondence shall be used to maintain communications.

A.   Staff Allocation, Expertise, and Level of Effort

The Contractor shall ensure availability and competence of the work force necessary to execute the management and technical scope of work specified in this Task Order. The

Contractor shall manage staff allocation to the required tasks and deliverables, described and constrained in this SOW.

B.   Management Reporting

The Contractor shall provide monthly status reports on the technical, cost, schedule, and staffing in accordance with the WBS to ensure the scope of work is completed per plan.

The contractor shall ensure that hours and costs associated with the two main functions in this task are tracked and documented separately (e.g., as three subtasks), and are reported to the government with this separate tracking indicated. These two areas are (1) LCRD I&T and (2) DTN. The contractor shall specify distinct costs for each of these three areas in the proposal, and shall propose how this reporting will be accomplished during task execution.

C.   Configuration Management

The Contractor shall provide technical consultation and guidance to the component PDL's to implement standard Configuration Management processes for the ITOS platforms in four Payload laboratories: 1. Controller Electronics laboratory (B11), 2. Modems laboratory (B29/Rm150 or off-site), 3. Space Switching Unit (SSU)/Flight Software (FSW) laboratory (B23), and 4. Optical Module laboratory (B29, Rm 160).

D.   Risk Management and Best Practices

The Contractor shall identify, evaluate, and bring forward risks with any of the LCRD ITOS development or interfaces supporting I&T activities.

E.   Information Technology Security

The Contractor shall be responsible for Information Technology (IT) security for all systems provided by the Contractor for NASA or used by an external partner connected to a NASA network. The Contractor shall generate applicable Security Agreements, Documents and procedures for connecting NASA networks with external partners (JPL and SSL).

IV.   Technical Approach

A.   Requirements

A.1.   The contractor shall coordinate:

The contractor shall coordinate with the LCRD project in planning for and implementing strategies for standardization and upward compatible products developed during component/Payload I&T for re-use during transition from ground I&T to mission operations.

A.2.   The contractor shall coordinate with the LCRD project to support planning for the integration and test of the LCRD-HMOC-LMOC systems, incorporating lessons learned from LLCD.

B.   Support Service

The Contractor shall provide support services commensurate with the requirements as described in section A and the allocated budget.

C.   Organizational Interfaces

The Organizational Interfaces include the Space Systems Loral (SSL) and team members from NASA GSFC and the Jet Propulsion Laboratory (JPL).

D.   Management Reporting

The Contractor shall provide monthly status reports on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

E.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

The Contractor shall review the usefulness of acquiring excess equipment from the MMS mission after delivery and post-launch.

V.   Government Furnished Facilities, Equipment, Software, and Other Resources

None

VI.   Equipment Procurement

The Contractor shall propose equipment that they identify as necessary to perform the work associated with this Task Order. The Task Monitor shall concur with the materials list prior to procurement.

VII.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order, such as traveling to JPL, or Space Systems Loral.

Specifically, the contractor shall support the travel requirements as described in the table below:

Travel Description: DTN Sub-task	Approximate Time Frame
DTN Network Management Meeting at MSFC	January 2015
DTN Network Management Meeting at JPL	April 2015

VIII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

Deliverable Description	Due Date
Subtasks Combined: Monthly Report; progress, schedule, problems. Component I&T Laboratory Status	Monthly
Subtask 1: Capture meetings notes and distribute (sub-task	Within 2 days of meetings.
Subtask 2: DTN Products & Demonstrations	
Network Management Console v1 Distribution Kit	11/30/14
Network Management Console v2 Demonstration	9/1/15
Network Management Console v2 Distribution Kit	9/25/15

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: 019
Modification: 0
Task Name: SAMPEX Mission Operations
Task Period of Performance: 03/01/2012 to 02/28/2013
Modification Period of Performance: 03/01/2012 to 02/28/2013
GSMO SOW Reference: 3, 3.3

I. Task Order History

Description of current modification (Modification 0): This is the initial task order statement of work for SAMPEX Mission Operations task.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.

II. Background

The SAMPEX spacecraft was launched on July 3, 1992 and is operated at Bowie State Operation Center.

This Statement of Work (SOW) defines the tasks required to provide mission operations for the SAMPEX spacecraft and its instruments, mission support services, attitude operations (if required) and the ground-based mission operations systems, located at Bowie State University in Bowie, Maryland and the Backup Ops Center at the Goddard Space Flight Center (GSFC) in Greenbelt, Maryland. An overview of the SAMPEX mission objectives and requirements for all ground system elements and flight operations, are contained in the following document:

  A) SAMPEX System and Operations Requirement Document, February 1991
  B) SAMPEX Flight Procedures Document

- The GSFC's Space Science Mission Operations (SSMO) Project (GSFC Code 444) is responsible for SAMPEX mission operations and mission support services. The government's active participation in flight operations management will incrementally increase with operational situation severity.

- The responsibilities specific to the management and technical requirements of the Flight Operations Team (FOT) are described in general terms in Section A of this SOW. Additional details are provided in the documents listed above.

The services described in the task order require capabilities beyond the scope of this SOW in order to provide complete functionality required to meet the SAMPEX mission objectives. The Government will provide the Ground Network (GN) services necessary to perform the activities required by this Task Order through other contracts. The Government will provide Flight Dynamics Orbit and Planning and Scheduling products necessary to perform the activities required by this SOW through other Task Orders under the GSMO contract.

III.   Scope of Work

The Contractor shall perform mission operations and support services for SAMPEX spacecraft and instruments according to all agency, project and mission guidance and requirements. To successfully operate these assets, the Contractor shall operate and maintain the elements of the SAMPEX Mission Operations Center (MOC) ground system.

The Contractor shall support feasibility and technical studies related to SAMPEX operations concepts and science data acquisition as required.

The work to be performed shall be carried out under direction by the SSMO Mission Director or other Government representatives identified by the SSMO Project. For normal operations, the SSMO Mission Director or his/her designate will have oversight of all procedures used to operate and maintain the spacecraft, their instruments and space/ground support activities. During special operations, the SSMO Mission Director shall provide final approval for all planning, execution and post-event analysis. During contingency operations, the SSMO Mission Director shall lead efforts in analysis, planning, execution and post-activity analysis.

Since this task is not responsible for software development, the Capability Maturity Model Integration (CMMI) requirement does not apply.

A.   Requirements

The Contractor shall perform mission operations of the on-orbit SAMPEX spacecraft consistent with other sections of this Statement of Work. Mission operations include SAMPEX flight operations, science data processing, attitude operations (if required) and flight dynamics operations.

A.1.   Flight Operations:

The Contractor shall perform flight operations of the on-orbit SAMPEX spacecraft consistent with this SOW. Flight operations includes all activities necessary to maintain spacecraft and instrument health and safety while working to achieve the objectives of the mission, provide daily operational continuity and perform on-going monitoring and analysis of onboard and ground systems. Planning, execution and post-event analysis will also be performed for special events. The science data recovery requirement for the SAMPEX mission is "best effort", with a goal of 90% of the data collected onboard the SSR during normal operations. The percent captured will be calculated and evaluated on a monthly basis. Finally, the Contractor shall be responsible for the planning, execution and evaluation of contingency operations through its FOT and the SSMO provided Anomaly Support Team (AST) described in section A.4 below.

A.2.   Planning and Scheduling:

The Contractor shall secure adequate communications services through the Near Earth Network (NEN) for the delivery of SAMPEX spacecraft and instrument telemetry to the ground and the commanding and tracking of the SAMPEX spacecraft.

A.3.   Real-Time and Offline Operations:

also responsible for development of a corrective action recommendation to be given to the SSMO Mission Director. The Contractor shall participate in the analysis of such anomalies in support of the AST, ~~~~~~ The Contractor shall also implement corrective actions as authorized by the SSMO Mission Director.

Support for Resolution of Ground-based Anomalies: Under the oversight of the SSMO Mission Director, the Contractor shall have responsibility for analysis and resolution of anomalies that are determined to be the result of performance or failure of a ground-based system or subsystem, or a result of procedural error.

A.5.   Spacecraft Subsystems and Associated Operations:

The Contractor shall plan, perform and assess real-time, special and contingency operations that involve or impact any SAMPEX spacecraft subsystem. The Contractor shall support operational engineering and performance analysis of, at a minimum, the Power Subsystem, Thermal Subsystem, Command and Data Handling (C&DH) Subsystem, Attitude Control and Determination (ACAD) Subsystem and Communications Subsystem.

A.6.   Performance Analysis and Trending:

The Contractor shall collect and store the housekeeping and health and safety data from the SAMPEX spacecraft. The Contractor shall also process, trend and analyze these data on a short-term, long-term and periodic basis depending on the specific parameters and objectives. The Contractor shall identify any parameters that might demonstrate unacceptable performance degradation with time and trends that could lead to future performance loss or degradation of SAMPEX flight hardware.

In addition, ad hoc reports shall be generated as needed to support anomaly investigations and any special reports requested by SSMO Mission Director.

A.7.   Spacecraft & Instrument Off-Line Engineering Support:

The Contractor shall provide off-line engineering support for the SAMPEX spacecraft and the instrument for all special engineering activities and contingency operations. Off-line, in-depth analysis shall be performed in order to validate spacecraft subsystem and instrument performance as well as to investigate any anomalies or trends that may occur. This includes support to investigate any instrument anomalies.

The contractor shall maintain a set of configuration controlled flight operations procedures, which include procedures for nominal, special and contingency operations.

The Contractor shall maintain and update documentation, plans and procedures as required in support of mission operations and mission support activities.

The Contractor shall maintain and update flight team training plans and provide the necessary training as classroom training, training exercises, and simulations.

A.8.   Data Processing System:

The contractor shall provide Data Processing System (DPS) support for the SAMPEX mission to deliver data to the Aerospace Corporation as directed.

A.9. Flight Operations Mission Library:

The contractor shall maintain a library of current operating documents and reports for the SAMPEX mission. This library shall serve as a:

1. Repository of the SAMPEX mission history
2. Reference library for flight operations training
3. On-console reference library for flight operations activities
4. Spacecraft manufacturer provided documentation
5. Repository of flight operations procedures, activity plans, and command authorization meeting presentations

A.10. Training and Certification of Personnel:

The Contractor shall maintain and execute a formal training and certification program. The objective of this program shall be to assure mission success by cultivating a diverse, competent staff of FOT professionals. This program shall include an active process of progressive skills enhancement, cross-training and contingency operations readiness. The program shall include a matrix of FOT positions and skills with defined certification levels and targeted staff certification goals. The Contractor shall report metrics on training and certification on a monthly basis.

A.11. Support Services:

1. MOC Facilities:

The primary SAMPEX Mission Operations Center is located at Bowie State University at Bowie. The Backup MOC is located in B14 at GSFC. The building and environmental control for the backup Mission Operations Center (MOC) located at GSFC will be provided by the Government as will all networks, hardware and system software necessary to support SAMPEX mission operations activities and interfaces.

The Contractor shall supply the administration and configuration management for all hardware needed to support the MOC, spacecraft operations engineering, real-time engineering and contract staff.

The hardware required to support the MOC includes, but is not limited to:

- Data Processing System (DPS)
- Flight Dynamics System (FDS)
- Mission Planning System (MPS)
- Integration Test and Operations System (ITOS)

2. Hardware, Software, Database and Document Configuration and Maintenance:

Hardware, software, database and document configuration management (CM) will be controlled via the mechanisms referenced in A.13. The Contractor shall

follow all procedures and guidelines specified in the MOC Configuration Management Plan in proposing, analyzing, implementing and recording changes to systems associated with the MOC.

Change Requests which effect elements outside the SAMPEX MOC, or as specified in the MOC Configuration Management Plan, shall be submitted by the Contractor to the SSMO Mission Director.

The contractor shall perform all system administration functions, including H/W and S/W maintenance, for all desktop systems located in the prime and backup MOC and associated space.

A.12. Organizational Interfaces:

The Contractor shall manage the external interfaces. In coordination with the external elements, the Contractor shall evaluate the need and impact of changes in the interfaces required to support SAMPEX mission operations. The Contractor shall coordinate any changes through the SSMO Mission Director.

   1.   *Routine Operations*

   The Contractor shall support and maintain the interfaces required for routine operations and coordination of SAMPEX mission activities.

   2.   Cooperative Mission Activities

   The Contractor shall support communication and coordination, as required, between the SAMPEX mission and other U.S. and non-U.S. missions.

   3.   International Partners

   The Contractor shall support operational interfaces with International Partners in support of SAMPEX mission operations as directed.

A.13. Configuration Management:

The Contractor shall maintain and execute an MMOC Configuration Management Plan for operational products.

The Contractor shall accurately track changes to mission operations requirements, products, systems, software, and the on-orbit spacecraft configuration. The SSMO Mission Director shall approve Level 3 configuration changes before the changes are implemented. The Contractor shall also track and maintain changes to Interface Control Documents and interfaces with network and other institutional facilities.

A.14. Operations Facilities:

The Contractor shall establish the FOT within the primary Mission Operations Center (MOC) currently located at Bowie State University at Bowie. The

Contractor shall provide all office supplies and consumables used in the daily execution of this contract.

A.15.   Risk Management and Best Practices:

The Contractor shall identify and evaluate risks and shall recommend to the SSMO Mission Director any changes to systems or procedures that could reduce or eliminate the risk.

The Contractor shall have a process for applying lessons learned and best practices from other NASA missions to the SAMPEX mission. The Contractor shall have a process for minimizing the number and impact of operational errors. The Contractor shall report all operational errors to the SSMO Mission Director as they occur and at the weekly status review.

A.16.   Information Technology Security:

The Contractor shall be responsible for Information Technology (IT) security for all systems operated by the Contractor for NASA or used by the Contractor to connect to a NASA network. All activities shall be in compliance with NASA policies and guidance defined by NPG 2810.1.

A.17.   Performance Metrics:

The following metrics are intended as example indicators of the SAMPEX mission accomplishments and performance relative to mission requirements and objectives.

1.   The Contractor shall report missed and/or unsuccessful supports that adversely affect operations.

2.   The Contractor shall report on a weekly basis the percentage of science data captured.

3.   On a weekly basis, the Contractor shall report on the status of staffing levels, training and certification activities and identify any known areas of future attrition.

B.   Management Reporting

The Contractor shall create and maintain a Mission Management Plan for SAMPEX. This document shall describe the manner in which the Contractor will manage (including staff organization) the mission operations and the work described in this Task Order.

The Contractor shall provide weekly status reports and informal reviews on the technical, cost, schedule and operational performance of the operation team at the mission level. The contractor shall propose the task with cost estimates at the mission level. Reports of anomaly detection, isolation and resolution shall be provided. Planning, status and as-flown reports shall be provided for special operations as requested.

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV.   Government Furnished Facilities, Equipment, Software, and Other Resources

The Government will provide the facilities and the facility services for those SAMPEX mission support functions performed at Bowie State University, on site at the GSFC, and WFF. Office and workstation furniture required to manage and operate SAMPEX spacecraft and its ground support elements will be provided. The Contractor may have access to office space located within the BSOCC at Bowie State University to support SAMPEX mission operations and FOT management requirements.

The Contractor shall be accountable for all SAMPEX Government Furnished Equipment (GFE). A summary of GFE hardware and associated software will be provided.

V.   Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this SOW. The Task Monitor shall concur with the materials list prior to procurement.

VI.   Travel Support

There is no specific travel needs for this task.

VII.   Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

Weekly Spacecraft Performance Report: The Contractor shall generate Weekly Spacecraft Performance Reports. The report shall include, as a minimum, a summary of the overall status and performance of the spacecraft and its instruments for the week, operational statistics, major upcoming activities, and status, performance, and plans for each spacecraft subsystem. The report shall discuss the results of the trending analysis and highlight any areas of potential concern.

Anomaly Closeout Reports: This report shall describe how the anomaly was discovered, what were the results of the anomaly investigation, the impact of the anomaly, any interim work-around (if required), and the final resolution of the anomaly. The Anomaly Closeout Report shall be provided to the SSMO Mission Director within 10 business days of the resolution of the anomaly.

End-of-Mission Plan: Working with NASA personnel, the Contractor shall prepare/maintain an End-of-Mission Plan for the SAMPEX spacecraft. This plan shall be delivered to the SSMO Mission Director during the initial period of performance.

GFE (Hardware and Software) report: This report shall include a summary of the baseline Government Furnished Equipment (H/W & S/W) used by the mission. The report shall be delivered to the SSMO Mission Director during the initial period of performance.

ID	Deliverable Description	Due Date
1	Weekly Spacecraft Performance Report	COB Wed
2	Anomaly Closeout Reports	Within 10 days of resolution of anomaly
3	End of Mission Plan	
4	GFE (Hardware and Software) report	By March 31, 2012

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: **21**
Modification: 05
Task Name: Satellite Servicing Capabilities Office
Task Period of Performance: March 1, 2012 to February 29, 2016
Modification Period of Performance: March 1, 2015 to February 29, 2016
GSMO SOW Reference: 2.3.1

I.   Task Order History

Description of current modification (Modification 05): This is the fifth modification of
the task order statement of work for the Satellite Servicing Capabilities Office task.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	07/16/2012	02/28/2013	Under floor clean-up and floor tile upgrade for Building 3 C156 and Building 14 N084 and N088.
2	03/01/2013	02/28/2014	General facility engineering support of Building 14 W10A through F, N084, N088, and Building 3 C156
3	03/01/2014	02/28/2015	Continuation of general facility engineering support of Building 14 W10A through F, N084, N088, and Building 3 C156
4	08/20/2014		Administrative modification
5	03/01/2014	02/29/2016	Continuation of general facility engineering support of Building 14 W10A through F, N084, N088, and Building 3 C156

II.   Background

The Satellite Servicing Capabilities Office (SSCO) Code 408 has implemented a Missions
Operations Center at GSFC in Building 14 Rooms W10A thru F called the Goddard Space
Servicing Control Center (GSSCC). Development labs in Building 14 N084 and Building 3 Room
C156, and administrative space in Bldg 14 N088 were recently added.
This task order authorizes the Contractor to perform general facility engineering support activities
for the GSSCC and the recently added development labs and administrative spaces described
above. This task provides services in support of design, implementation, upgrade and
maintenance of the GSSCC operational, development labs and administrative areas
The Contractor assumes full contract responsibility for this task for the period.

III.   Scope of Work

The Contractor shall provide facilities engineering support for the SSCO. A description of this
support is provided in the Section 3.1.

A.   Requirements

A.1 Support Requirements

A1.1 SSCO Design changes, Maintainability, Upgrade and Maintenance
The Contractor shall provide facilities engineering support for the SSCO developmental, operational, and administrative offices including support of the following major elements:

Facility Engineering

The Contractor shall propose the staffing levels and Materials required to perform the following: Design changes, Maintainability, upgrade and maintenance of the SSCO. Support activities include:
- Work with customer to define console and administrative workspace requirements
- Interface with building engineers and FMD to modify power, lighting and physical security elements such as keycard readers and cameras
- Removal and upgrade of existing infrastructure including floor tiles and cabling
- Installation and maintainability of video and multimedia devices

For Modification 01, the Contractor shall propose the staffing levels and Materials required to perform the following: Design changes, implementation and upgrade of the expanded areas mentioned above. Support activities include:

- Removal and replacement of existing floor tiles in Building 3 Room C156 with the exception of perimeter tiles whose removal is prevented by wall or door entry point restrictions
- Removal of under floor data and communication cables in Building 3 Room C156
- Removal of existing furniture during floor renovations and reassembly if required in Building 3 Room C156
- Removal and replacement of all floor tiles in Building 14 Room N088 with the exception of perimeter tiles whose removal is prevented by wall or door entry point restrictions and select floor tiles in Building 14 Room N084
- Removal of under floor data and communication cables in Building 14 Rooms N084 and N088
- Removal of existing furniture during floor renovations and reassembly if required in Building 14 Room N084 and N088
- Additional power and data lines will not be required.
- Movement of existing hardware to new locations will be performed by non-facility engineering staff.
- Prep, paint and install trim base in Building 14 Room N088

For Modification 02, the Contractor shall propose the staffing levels and materials required to perform the following: General design changes, implementation and maintainability of the GSSC and recently expanded areas mentioned above. Support activities include:

- Work with customer to define console and administrative workspace requirements
- Perform general console and furniture assembly/disassembly and/or relocation
- Interface with building engineers and FMD to perform minor power, network and lighting changes
- Perform minor removal and upgrade of existing infrastructure including floor tiles and cabling
- Install and maintain video and multimedia devices including screens and whiteboards

For Modification 03, the Contractor shall propose the staffing levels and materials required to continue performing the following: General design changes, implementation and maintainability of the GSSC and recently expanded areas mentioned above. Support activities include:

- Work with customer to define console and administrative workspace requirements
- Perform general console and furniture assembly/disassembly and/or relocation
- Interface with building engineers and FMD to perform minor power, network and lighting changes
- Perform minor removal and upgrade of existing infrastructure including floor tiles and cabling
- Install and maintain video and multimedia devices including screens and whiteboards

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the SSCO task to the SSCO Task Monitor.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this SSCO Task Order. This support includes preparation and cooperation during property audits.

IV.   Government Furnished Facilities, Equipment, Software, and Other Resources

There are no Government furnished facilities, equipment, or software associated with this SSCO Task Order.

V.   Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this SSCO Task Order.

VI.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order. Local and nonlocal travel is not anticipated for the period of performance.

Specifically, the contractor shall support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
N/A	N/A

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Monthly Report	End of each month as required
2	Completed Building 3 Room C156 furniture removal, floor tile upgrade, under floor clean-up.	August 24, 2012
3	Completed Building 14 Rooms N084 and N088 furniture removal, floor tile upgrade, under floor clean-up.	August 31, 2012

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: **22**
Modification: 9
Task Name: Office of Communications Multimedia Support
Task Period of Performance: 03/01/2012 to 02/28/2015
Mod Period of Performance: 04/13/2015 to 02/29/2016
GSMO SOW Reference: 4

I.   Task Order History

Description of current modification (Modification 9): This modification to the task order statement of work for Office of Communications Multimedia Support extends the period of performance.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	07/16/2012	09/14/2012	Provide the design and equipment identification for a TV Production Studio at Wallops Flight Facility.
2	12/17/2012	02/28/2013	Provide the implementation of the Wallops DTV Launch Project. This includes equipment purchases, installation/testing and production support for first launch.
3	03/01/2013	02/28/2014	Revised statement of work for the Office of Communications and related multimedia support to extend task for another year and to add additional requirements.
4	03/01/2013	02/28/2014	Replanning Mod
5	03/01/2013	02/28/2015	Extend the period of performance and add international travel and other requirements.
6	10/6/2014	2/28/2015	The contractor shall procure and install a short-throw, lampless laser projector with a special short throw high-angle lens for the new Solarium Exhibit in the GSFC Visitor's Center. Solarium is a projected video that features ultra HD footage of the sun from NASA's Solar Dynamics Observatory. This procurement includes any special mounting and or/mounting plates to install the projector.
7	12/19/14	2/28/15	The contractor shall identify and procure equipment needed to update the current animation computer work stations and supplement the existing animation render farm and storage network.

8	03/1/15	2/29/16	Extend the period of performance for an additional year.
9	04/13/15	2/29/16	The contractor shall identify and procure equipment to upgrade the video asset management systems to be compliant with current IT requirements allowing continue use of the NASA IT infrastructure. And to provide on a non-interference basis a transition from the existing GVSAN to the MAM system. Installation is at NASA Goddard Space Flight Center located in Greenbelt, Maryland.

II.   Background

Office of Communications

The Office of Communications creates, disseminates and manages a comprehensive communications program that employs a suite of products and activities to inform, educate and engage the public about NASA, and the missions and research programs assigned to and carried out by NASA's Goddard Space Flight Center. The primary mission of the Office is to meet NASA's requirement, as stated in the Space Act of 1958, to disseminate information about NASA's programs and activities as widely as practicable. This mission is accomplished by an experienced and professional staff of communications experts who plan and execute comprehensive, multi-faceted and far-reaching campaigns that inform and engage a variety of consumers, including the news media, students and educators, opinion leaders and the general public.

The Office of Communications accomplishes its mission by creating world-class content that is distributed through a vast network of dissemination resources, and conducting exciting and interesting public events and programs that allow the public to engage with NASA employees and learn how Goddard's research benefits society and impacts and improves their daily lives. The Office accomplishes it mission by:
·   Creating compelling text-based and multi-media products (news releases, press kits, news conferences, animations, data-visualizations, Dome-shows, 3D and Science on a Sphere movies, still imagery, and broadcast-quality digital video and audio products) that is distributed directly to the public and through traditional print and broadcast and new media outlets, NASA web sites and social networking sites, educational and non-profit institutions, museums and science centers and the private sector.
·   Developing and executing an expansive array of informal learning and public engagement programs, including community events, public lectures, hands-on demonstrations, special events and speaker's bureau services.
·   Managing and operating Visitor Centers in Greenbelt, Md., and Wallops Island, Va., and working in partnership with museums and science centers across the nation.
·   Managing Center-wide internal communications and information services, including the Center's official newsletters and internal web site.

· Planning and administering the Center's protocol and guest operations functions, responsible for receiving and briefing of distinguished visitors at all levels representing the scientific, government, professional, business and public communities – foreign and domestic.

· Conducting the Freedom of Information Act function, responding to requests for information and furnishing responsive material to the public.

The Office of Communications provides a leadership role in shaping Goddard's image, both externally and internally, as a vibrant, exciting place to work that values and embraces innovation, inclusion and diversity.

III.   Scope of Work

The Contractor shall provide the Goddard Space Flight Center's (GSFC's) Office of Communications (OC) the highest quality media and related support for, but not limited to, television, multimedia and the web, in keeping with NASA's statutory obligation to provide for the widest and most practicable dissemination of information. Accordingly, the Contractor shall provide the necessary personnel, daily maintenance, and related services needed for broad and comprehensive video production to support the GSFC OC. In providing media and related support, the Contractor shall create and provide certain video production, animation, multimedia, and similar products to the GSFC OC. Most of this work will be performed on the Greenbelt Campus, although some travel may be required.

A.   Requirements

A.1.   Video Production: The contractor shall plan, write treatments and scripts, create storyboards, operate lights and camera equipment, direct, edit, and produce, and archive a wide array of video, audio, and multimedia products. This includes but is not limited to, video news releases, video resource material, music videos, training classes, lectures and presentations, satellite media tours, press conferences, webcasts, educational programming, and content for special venues.

A.2.   Video Acquisition and Camera Operation: The contractor shall document activities and programs at GSFC, conduct interviews and collect footage on a wide variety of subject matter, and operate cameras. Safely operates cameras in sensitive areas such as engineering labs and clean rooms.

A.3.   Video Editing: The contractor shall provide video editing services using workstations and the Goddard Video Storage Area Network (GVSAN).

A.4.   Studio Management: The contractor shall manage, operate, and maintain the GSFC High Definition (HD) Studio and Television Control Room. Maintain and repair equipment. Provide engineering support for live television programming, including, satellite media tours and live shots. Provide cross training for operations staff to enable backup support for live events.

A.5.   Media SAN: The contractor shall manage and maintain the Goddard Video Storage Area Network (GVSAN). Archive edited content and provide regular backups of all Goddard video products. Coordinate support for MediaSAN and editing workstations with IT Systems Administrator.

A.6.   Animation and Motion Graphics: The contractor shall produce wide array of animation and motion graphics products. Format existing animation or computer generated files for NASA TV. Archive and back up all animation building blocks and final renders including models, textures, and scene files. Prepare animation files for traditional photographic and print master graphics.

A.7.   Production Management: The contractor shall maintain schedules for HD Studio, editing facilities, and the video cameras. Schedule and manage limited production resources. Efficiently manage video projects and provide monthly production reports of accomplishments, labor and cost data, future deliverable and updated work plans.

A.8.   Equipment Purchases: Contractor shall recommend and purchase equipment and supplies as directed.

- Media SAN & Animation Repair/Replacement: The contractor shall provide equipment recommendations, price estimates, & purchase equipment for GVSAN video editing system & CI Lab animation storage. ▬▬ › Please Note – This is not a capital asset… there is no single piece of equipment totaling ▬▬

- OC Newsroom Upgrade – Contractor shall recommend, purchase & then install HD television monitors within the Office of Communications. ▬▬▬

- The contractor shall utilize a music library service and purchase music licenses..

- The contractor shall procure and install a short-throw, lampless laser projector with a special short throw high-angle lens for the new Solarium Exhibit in the GSFC Visitor's Center. Solarium is a projected video that features ultra HD footage of the sun from NASA's Solar Dynamics Observatory. This procurement includes any special mounting and or/mounting plates to install the projector. ▬▬▬▬▬▬▬▬

- The contractor shall identify and procure equipment needed to update the current animation computer work stations and supplement the existing animation render farm and storage network. ▬▬▬▬▬▬▬

- NASA GSFC currently utilizes a legacy Goddard Video Storage Area Network (GVSAN) with variable capabilities. The daily digital media operations are limited by the inefficiencies in the aging system, IT security roadblocks, and proprietary data formats. As a result the government requires a transition from the existing legacy systems on a quick turn-a-round basis. This requires system design upgrade development and installation of the next generation emerging video management technology into the Goddard Television's (GTV) postproduction facility. This system upgrade will be referred to as the Media Asset Management (MAM) in this modification.

   The MAM shall be a turnkey system compatible with the existing Science TV Studio the DTV control room, and other DTV infrastructure.

   The contractor shall supply all labor and equipment necessary to develop an equipment list and will procure, install, and integrate said systems to the optimum form, fit and function as provided by the network specifications.

A.9.   Equipment Management: The contractor shall maintain property records in accordance with NASA PP&E System procedures for all controlled equipment assigned to their property

account. This includes: acquisition, receipt, utilization, and disposal. Equipment Management includes the following general tasks for the proper account and safeguard of NASA's property:
   a. Identify personal property
   b. Record assets in the PP&E System and properly assign them
   c. Maintaining records relating to the assets
   d. Monitor the movement of assets
   e. Record changes in physical condition of the asset(s)
   f. Conduct physical inventories
   g. Reconcile the results of the inventories
   h. Report all losses, thefts, and damages of assets
   i. Reutilize assets when possible
   j. Dispose of assets properly

A.10.   Satellite Media Tours: The contractor shall coordinate the use of NASA TV infrastructure to conduct interviews with the media via broadcast satellite. Contractor may be required to purchase satellite time.

A.11.   Management and Administrative Support: The Contractor shall provide all necessary management and administrative support required to execute this task. At a minimum this shall include a Project Manager (PM), who shall be the point of contact of all Contractor services and products and the authorized supervisor for technical and administrative work performed under this task. Specifically, as the minimum requirements, the Contractor shall provide management and administrative support for the objectives of the NASA Goddard's OC as described in more detail under requirements, above, which are as follows: video production, video acquisition and camera operation, video editing, studio management, media SAN, animation and motion graphics, and production management, equipment purchases, equipment management and satellite media tours.

A.12.   Create subtask 22.4 to provide multimedia and television surge support to WFF including, but not limited to, the Antares Orb-2 & Orb-3 launches. This includes technical support, web, media, and social media duties during launch ▬▬▬▬▬▬▬▬▬▬▬▬▬▬▬
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▬▬▬▬▬▬▬▬ We recognize that this depends on level of support provided by HQ & JSC.

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor. The contractor shall also provide monthly production reports including accomplishments, future deliverables and updated project work plans.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by

the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

Contractor shall use government furnished facilities in building 28, and government furnished ECN Tagged equipment to perform work associated with this Task Order. No government provided software. Computerized Maintenance Management system is non-applicable.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order. This includes mission critical international and domestic travel to document hardware and launches.

Trips to Greenland, Germany, Japan, Chile, Canada, and other locations are possible.

VII. Deliverables

The Contractor shall provide the following deliverables, but are not limited to the following in support of the Task Order:

Final delivery of all products shall be to the National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Maryland, 20771. Attention: Wade Sisler, Executive Producer, Office of Communications, Mail Code 130.

ID	Deliverable Description	Due Date
1	Multimedia products as directed;	TBD
2	Financial Reports, including the 533M;	TBD
3	Monthly status reports on selected projects as directed;	TBD
4	Budget planning data as required; and	TBD

5	Other documentation as required including, but not limited to, reports, surveys, and studies.	TBD
6	Media SAN & Animation Repair/Replacement ▬▬ ▬▬	May 30, 2013
7	OC Newsroom Upgrade (▬▬	May 30, 2013
8	Provide support to create a "Science on a Sphere" Film in support of GPM. Support will include additional editing, motion graphics, music, narration, and travel.	Feb. 28, 2014
9	Create subtask 22.4 to provide multimedia and television surge support to WFF including but not limited to the Antares Orb-2 & Orb-3 launches. ▬▬▬	Feb. 28, 2015
10	The contractor shall procure and install a short-throw, lampless laser projector with a special short throw high-angle lens for the new Solarium Exhibit in the GSFC Visitor's Center. Solarium is a projected video that features ultra HD footage of the sun from NASA's Solar Dynamics Observatory. This procurement includes any special mounting and or/mounting plates to install the projector.. ▬▬	October 31, 2014
11	The contractor shall identify and procure equipment needed to update the current animation computer work stations and supplement the existing animation render farm and storage network. ▬▬	February 28, 2015
12	The contractor shall identify and procure equipment needed to update the current existing storage network. The contactor shall provide an overall transition plan that includes proposed system design, workflow, training schedule, and estimates of annual costs maintenance costs. ▬▬	February 29, 2016

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: **#023**
Modification: **6**
Task Name: **Terra Spacecraft Sustaining Engineering**
Task Period of Performance: **09/01/2014-02/29/2016**
Modification Period of Performance: 03/01/2015-02/29/2016
GSMO SOW Reference: 2.1

I. Task Order History

Description of current modification (Modification 6): This is an extension modification
to the task order statement of work for Terra Spacecraft Sustaining Engineering support.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	03/01/2013	02/28/2014	Removed required support specific for evaluation and recommendations regarding propulsive maneuver and attitude control with array rotating. This effort was successfully completed within Mod #0 period of performance.
2	03/15/2013		Administrative Modification
3	03/01/2014	02/28/2015	Modified performance period. Added support of weekly Mission Director Top Ten status meetings, reviews, impingement model, Solid State Recorder automation, Battery Improvements and maneuver streamlining.
4	03/12/2014		Administrative Modification
5	09/01/2014	02/28/2015	Added value due to additional hours needed to support anomaly investigations, including star tracker analysis
6	03/01/2015	02/29/2016	Updated period of performance, travel dates and removed deliverable regarding star tracker report

II. Background

The Terra spacecraft was launched in December 1999 and is a flagship mission within the
Earth Observing System (EOS) fleet of spacecraft. As the Terra spacecraft ages and
continues in an extended mission operation phase, sustaining engineering support is
required to ensure the spacecraft continues to operate as designed and is capable of
achieving science objectives. This Task Order defines the work required to provide on-
going sustaining engineering support of the EOS Terra spacecraft.

The GSFC's Earth Science Mission Operations (ESMO) Project (GSFC Code 428) is responsible
for mission operations and mission support services. The Mission Director for Terra directly
manages all mission operations and sustaining engineering activities.   The Mission Director or a
designated technical representative will act as the Task Manager. All issues, technical, financial
and administrative, related to this task shall be coordinated with the Task Manager.

III. Scope of Work

The Contractor shall provide Terra Spacecraft Engineering expertise to ESMO and the Terra Flight Operations Team in support of Terra Operations and Anomaly Resolution.

A.   Requirements

A.1.   The Contractor shall provide support and conduct analysis of Terra spacecraft anomalies and special spacecraft activities.

A.2.   The Contractor shall participate in Anomaly Review Boards when requested by the Terra Mission Director, review and advise on proposed recovery activities, and may be asked to provide other discipline experts as needed to support anomaly investigation and resolution.

A.3.   The Contractor shall review Terra Inclination Maneuvers and subsystem performance.

A.4.   The Contractor shall provide consultation to Terra Flight Operations Team Subsystem Engineers in the areas of Guidance, Navigation and Control; Thermal Control; Flight Software; Command and Data Handling; Communications; and Electrical Power.

A.5.   The Contractor shall support the Flight Software Maintenance Team to evaluate flight software code modifications, review code modifications planned for implementation, and results of tests and simulations.

A.6.   The Contractor shall provide consultation for Terra Simulator issues.

A.7.   The Contractor shall support End of Life Planning and Preparation Activities

A.8.   The Contractor shall ensure availability and competency of the work force necessary to execute the management and technical activities required to support the Terra mission.

A.9.   The Contractor shall improve plume impingement model as needed. This is to improve understanding of propulsive maneuver stability with the solar array at various positions.

A.10.   The Contractor shall support weekly Mission Director Top Ten Status meetings.

A.11.   The Contractor shall support and provide recommendations on Battery Management enhancements to address Thermal Control limitations.

A.12.   The Contractor shall support the Flight Operation Team in providing Automation recommendations regarding Solid State Recorder

A.13.   The Contractor shall support the Flight Operation Team and developing concepts and providing recommendations regarding Drag Make-Up Maneuver streamlining. Streamlining the maneuver process is critical improve response time for High Interest Events regarding Conjunction Assessment.

A.14.   The Contractor, with specific knowledge of the Ball CT-601 Star Tracker, shall review Star Tracker performance and provide additional information about how the star trackers work, validation of root cause investigation conclusions and recommended recovery and/or enhancement actions as requested

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the

Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

There are no Government furnished facilities, equipment, or software associated with this Task Order.

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

Specifically, the contractor shall support the travel requirements as described in the table below:

Travel Description	Approximate Time Frame
Bi-Annual Working Group w/ Spacecraft Vendor (3 days onsite @ Goddard)	May 2015

VII. Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	Technical report summarizing support provided to FOT subsystem engineers, and flight software maintenance team.	Last day of August and Last day of February
	•	

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: **24**
Modification: **7**
Task Name: **SARLab IT Security Engineering**
Task Period of Performance: **03/01/2012 to 2/28/2015**
Modification Period of Performance: **03/01/2015 to 2/29/2016**
GSMO SOW Reference: 2.3.2.9

I.   Task Order History

Description of current modification (Modification 7): Modification 7 extends current support for an additional year, and adjusts support to accommodate additional system administration tasks.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	04/10/2012		Administrative Modification
2	10/17/2012		Administrative Modification
3	03/01/2013	02/28/2014	Period of performance extension
4	08/09/2013		Administrative Modification
5	11/12/13	02/28/2014	Addition of System Administration support for TSI and LEO/GEO LUT installation, and tech refresh.
6	03/01/14	02/28/2015	Extend current support for an additional year, remove tech refresh work, and adjust support to accommodate KACE server installation, maintenance and configuration management.
7	03/01/2015	02/29/2016	Extend current support for an additional year, and adjusts support to accommodate additional system administration tasks

II.   Background

The Search and Rescue Laboratory (SARLab) consolidates both the legacy System and Evaluation and Development Laboratory (SEDL) system and the Distress Alerting Satellite System (DASS) ground system.   These systems are at various stages of the Computer System Life Cycle.   The SARLab is an ongoing research and development environment.

The computers located in the building 25 lab, include but are not limited to, five systems comprising the Spread Receiver rack, five SEDL lab workstations, four antenna controllers, four DASS processors, three DASS servers, three DASS workstations, one backup system, one FTP server, ten Mid-Earth Orbiting Local User Terminal (MEOLUT) servers, and one Cisco ASA5505 firewall device.   A recent tech refresh has increased the number of systems, some of which may be removed in the future. All systems have a Windows operating system.

The data processed in the (SARLab) System is currently categorized as low impact per FIPS 199.

III.   Scope of Work

A.   Requirements

A.1.   Assist with interpreting and implementing IT Security changes that are frequently received (i.e. SP 800-53 Rev 4, NPR 2810.1A, NITRs, NCAD, NATT, NAMS, Data at Rest Encryption, etc.)

A.2.   Provide continuous monitoring analysis/reporting.

A.3.   Assist in SARLab risk mitigations and maintain POA&M updates/monthly reporting.

A.4.   Support contingency plan testing and documentation.

A.5. Attend required meetings
   i. Weekly FPD IT Management and Security meeting
   ii. Agency/Center project related meetings

A.6.   Update IT Security documentation (SAIV, Risk Assessment and Contingency Plan) to comply with NIST SP 800-53 Rev 4.

A.7. Provide System Administrator support to include but not limited to:
   i.   System Audit Monitoring
   ii.   KACE maintenance and configuration management
   iii. Backups
   iv.   Patching
   v.   Account Maintenance
   vi.   Vulnerability Management
   vii. Transition systems with an end of life operating system on a case-by-case basis as the project provides replacement systems
   viii. Deploy a new FTP server
   ix.   Migration of sys-log reporting from Qradar to Splunk
   x.   Enhance system backup and restoration process for systems not covered by vendor support
   xi.   Continue to enhance the security posture within the lab
   xii. Clean up existing network wiring and reduce the use of low-density Ethernet hubs
   xiii. Create, document and implement a process to clone systems before changes are applied
   xiv. Maintain SARLab IT standard operating procedures as processes change
   xv.   Assist in integrating new MEOLUT and new antenna equipment into the existing SARLab IT security infrastructure.

A.8. Provide Network Engineering support for firewall changes, including:
   i.   Replacement of frame relay circuit with PIP
   ii.   Additional VLANs to further segregate equipment
   iii. Other items as requested by SAR management

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the System Certification & Accreditation status to the DASS task lead engineer. Reports of security issues with resolution options shall be provided.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV.   Government Furnished Facilities, Equipment, Software, and Other Resources

The Government will provide the facilities and the facility services for the SARLab.

V.   Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

VII.   Deliverables

The Contractor shall provide the following deliverables in support of the Task Order:

ID	Deliverable Description	Due Date
1	SarLab Assessment and Authorization (A&A) Documentation (DRAFT)	Due 45 days after release of Code 400 SP 800-53 Rev 4 IT Security control implementation information
2	SarLab A&A Documentation (FINAL)	Due 15 days after SARLab IT Security documentation draft completion
3	New FTP Server deployment	March 31, 2015
4	Migration of Sys-Log reporting from Qradar to Splunk	June 1, 2015
5	System cloning process creation, documentation and implementation	July 1, 2015

End of Task Order Statement of Work

GSMO TASK ORDER

Task No: **25**
Modification: 4
Task Name: Earth Observing 1 Operations
Task Period of Performance: 3/1/12 to 2/29/16
Modification Period of Performance: 3/1/15 to 2/29/16
GSMO SOW Reference: 3, 3.3

I.   Task Order History

Description of current modification (Modification 4): Extension of period of performance for task order statement of work for Earth Observing 1 Operations task.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.
1	03/01/2013	02/28/2014	Continuation of work. No changes to Statement of Work.
3	03/01/2014	02/28/2015	Continuation of work. No changes to Statement of Work
4	03/01/2015	02/29/16	Continuation of work. No changes to Statement of Work except the addition of support of end of mission activities.

II.   Background

EO1 spacecraft (S/C) was launched on November 21, 2000. The S/C is owned and operated by NASA. The Flight Operations Team (FOT) is responsible for the daily operational support of the EO1 S/C at the Goddard Space Flight Center (GSFC) Greenbelt, Maryland.

The GSFC's Earth Science Mission Operations (ESMO) Project (GSFC Code 428) is responsible for EO1 S/C, mission operations and mission support services. The government's active participation in flight operations management will increase with operational situation severity.

The responsibilities specific to the management and technical requirements of the Flight Operations Team (FOT) are described in general terms in the Sections of this Task Order.

III.   Scope of Work

The Contractor The Contractor shall perform mission operations and mission support services in support of the on-orbit EO1 spacecraft. To successfully operate this asset, the Contractor shall operate and maintain the elements of the EO1 MOC ground system. The Contractor shall support end of mission activities.

The work to be performed shall be carried out under direction of the ESMO Mission Director (MD) or other Government representatives identified by the EOS Project. For normal operations, the MD or his/her designate will provide final approval of all procedures used to operate and maintain the spacecraft, their instruments and space/ground support activities. During special operations, the Mission Director or his/her designate will provide final approve for all planning, execution and post-event analysis. During contingency operations, the MD or his/her designate will lead efforts in analysis, planning, execution and post-activity analysis.

A.   Requirements

The Contractor shall create and maintain a Mission Management Plan. This document shall describe the manner in which the Contractor will manage the mission operations and the work described in this Task Order.

The Contractor shall maintain and execute a MOC Configuration Management Plan for operational products.

The Contractor shall operate and maintain a Government approved configuration management system. This system shall be used to manage change requests for ground hardware/software and space software, as well as technical and procedural documentation necessary for the operation and maintenance of the EO1 S/C and the EO1 ground-based mission operations systems.

Operations Facilities: The Contractor shall establish the FOT within the primary Mission Operations Center (MOC) currently located in Building 14 at the GSFC. The Contractor shall provide all office supplies and consumables used in the daily execution of this contract. The contractor shall provide a plan to establish a back up control center. The contractor shall define a plan and execute it to transition the control center from its current location to the new location still within building 14.

Risk Management and Best Practices. The Contractor shall identify and evaluate risks to EO1 mission operations. For those risks that are within the control of mission operations, the Contractor shall recommend to the ESMO Mission Director any changes to systems or procedures that could reduce or eliminate the risk.

The Contractor shall be responsible for Information Technology (IT) security for all systems operated by the Contractor for NASA or used by the Contractor to connect to a NASA network that requires compliance with GSFC and NASA security requirements. The contractor shall provide annual security training to MOC personnel. The Contractor shall make arrangements and coordinate security checks and scanning of operational systems as required by GSFC and the Agency.

The Contractor shall apply IT security standards as defined by NPG 2810.1 for systems classified as a Mission (MSN) for all IT systems. In addition, the Contractor shall comply with all Federal Rules and Regulations and Agency directives.

The contractor shall upgrade software and Hardware in the EO-1 MOC and associated elements of the ground system as needed to satisfy IT security requirements and to ensure system redundancy.

The Contractor shall support the system administration for the EO-1 flight software lab and selected machines in the EO-1 Mission Science Office related to planning and scheduling, and data products generation as needed.

The contractor shall make plans for the transition from MOPSS to ASPEN. Migrate from CMS to ASIST – Stored command Processor. Migrate from FEDS and DPS (functions) from DEC Alpha to Linux system.

Real-time support and Operations. The Contractor shall support real-time operations of the EO1 spacecraft from the GN Network and SN network as needed.

Anomaly Detection, Isolation, Analysis, Recovery and Reporting:

The Contractor shall monitor and maintain the health of the EO1 spacecraft, collect telemetry data and process available health and status telemetry data to assess the performance of each spacecraft subsystem and instrument.

In response to real-time spacecraft anomalies the contractor shall execute the pre-approved response (such as flight operations procedure, spacecraft commands, or script). In response to real-time spacecraft anomalies that do not have a pre-approved response (and the spacecraft is not in imminent danger of loss of mission), the contractor shall defer sending corrective action spacecraft commands in real-time. The ESMO Mission Director shall conduct anomaly review boards as needed to assess on-orbit problems and formulate a response using the appropriate expertise.

An anomaly is defined as the occurrence of any event that causes the spacecraft, its instruments, or any of the ground-based support systems to perform in a non-standard manner during any normal or special operation. An anomaly may occur in either on-orbit or ground-based elements of the EO1 mission operations system. The Contractor shall be responsible for support of anomaly resolution activities as defined in this section.

The Contractor shall report all level-1 anomalies (incidents) that occur to the spacecraft, the instruments, the Mission Operations Center, or other areas that impact the operation or safety of personnel and equipment. This report shall be made to the ESMO Mission Director within one business day, unless the incident is mission threatening in which case the parties shall be notified immediately. A summary of all Level-1 anomalies shall be received via e-mail within one business day.

A Level-1 anomaly is defined as any isolated accident, failure, or event that is likely to compromise the ability of an instrument or spacecraft to successfully complete its mission.

Specific examples of reportable anomalies during routine operations include:

- Loss of science data (i.e., communication failure, instrument failure, unexpected entry into a safe mode, etc.).

- Loss of redundancy onboard the spacecraft where an additional failure would result in the loss of the mission.

- Any event that jeopardizes the ability of the spacecraft to complete the expected mission life (i.e., loss of expendables, degraded solar array performance, etc.).

For each Level-1 anomaly the Contractor shall generate an Anomaly Closeout Report. This report shall describe how the anomaly was discovered, what were the results of the anomaly investigation, the impact of the anomaly, any interim work-around (if required), and the final resolution of the anomaly. The Anomaly Closeout Report shall be provided to the ESMO Mission Director within 10 business days of resolution of the anomaly.

Support for Resolution of On-Orbit Anomalies: The Government is responsible for assembling and managing an Anomaly Support Team (AST). In addition, the Government shall be responsible for any augmentation of technical staff to support anomaly analysis. The AST shall have lead responsibility for analysis of anomalies that are determined to be the result of the performance of

an on-orbit system or subsystem, or a result of a procedural error. The AST is also responsible for development of a corrective action recommendation to be given to the ESMO Mission Director. The Contractor shall participate in the analysis of such anomalies in support of the AST, when requested by ▬▬▬ ▬▬▬▬▬▬▬ the ESMO Mission Director. The Contractor shall also implement corrective actions as authorized by the ESMO Mission Director.

Support for Resolution of Ground-based Anomalies: ▬▬▬▬▬▬▬▬ ▬▬▬▬▬▬▬▬▬▬▬▬▬▬ the Contractor shall have responsibility for analysis and resolution of anomalies that are determined to be the result of performance or failure of the MOC ground-based system or subsystem, or a result of procedural error on systems within MOC control.

Performance Analysis and Trending. The Contractor shall collect and store the housekeeping and health and safety data from the EO1 S/C. The Contractor shall also process, trend and analyze these data on a short-term, long-term and periodic basis depending on the specific parameters and objectives. The Contractor shall identify any parameters that might demonstrate unacceptable performance degradation with time and trends that could lead to future performance loss or degradation of EO1 flight hardware in the Weekly Spacecraft Performance Report. The contractor shall also provide proposed recommendations/solutions for any such unacceptable performance degradations.

Spacecraft & Instrument Off-Line Engineering Support. The Contractor shall provide off-line engineering support for the EO1 S/C and for all special engineering activities and contingency operations. Off-line, in-depth analysis shall be performed in order to validate spacecraft subsystem and instrument performance as well as to investigate any anomalies or trends that may occur. This includes support for investigation of any instrument anomalies.

Procedures, Documentation and tools. The Contractor shall maintain a set of configuration controlled flight operations procedures, which include procedures for nominal, special and contingency operations. The Contractor shall maintain and update documentation, plans and procedures as required to support mission operations and mission support activities.

Training and Certification of Personnel. The Contractor shall maintain and execute a formal training and certification program. The objective of this program shall be to assure mission success by cultivating a diverse, competent staff of FOT professionals.

Performance Metrics:

The following metrics are intended as example indicators of the EO1 mission accomplishments and performance relative to mission requirements and objectives.

- Spacecraft contacts successfully supported is a key element of measurement, reflecting the frequency and nature of EO1 spacecraft contacts that are routinely and successfully supported on a daily basis. A spacecraft contact shall be deemed "unsuccessful" if all planned activities are not completed, command capability is not maintained for the duration of all staffed contacts, and/or if additional resources are required in order to complete all planned activities.

- Operational errors - Successful vs. unsuccessful preparation and execution of command and control sequences reflects performance of the FOT with regard to accuracy and timeliness of the process to formulate and execute instructions to the on-orbit asset. Stored command loads management will be assessed on the basis of ensuring an on-board command load does not terminate. Commanding for special events (including maneuvers, instrument reconfigurations, spacecraft component reconfigurations, and anomaly responses) will be assessed on the ability to be executed within the planned execution windows.

- Science data scheduled and acquired is a measure of the effectiveness to meet data acquisition requirements, and the effectiveness of delivering data acquired by the instrument to the designated receiving facilities. SSR management will be assessed on the ability to ensure a minimum of 80% of the science data is delivered to the designated receiving facilities, with an operational goal of 90% delivery.

- Science data scheduled but not acquired is a measure of the problems encountered, and of the operational practice of identifying and documenting failures in daily acquisition management. The minimum data delivery requirement is 90%, with an operational goal of 95%.

- Anomalies detected, analyzed, reported and resolved is a measure of the operational response to ad hoc situations and unexpected occurrences, and the performance of the Contractor in responding to these demands.

- State of documentation (procedures, operating instruction, etc.) is a measure of the attention to detail and the thoroughness applied to maintaining documentation files regarding the state of the systems and operational procedures employed in flight operations. Documentation control will be assessed based on GSFC ISO standards.

- Adherence to existing and developed configuration control mechanisms will be an indication of the procedural discipline enforced by the Contractor and their commitment to sound engineering and operational practices.

- The smooth operation of the EO1 system relies on a well-trained and motivated FOT. On a weekly basis, the Contractor shall report on the status of staffing levels, training and certification activities and identify any known areas of future attrition.

The performance metrics defined in general terms here shall be reported through regular monthly meetings, reports, and briefings presented by the Contractor and reviewed by the ESMO Mission Director and ESMO Project Management Staff.

B. Management Reporting

The Contractor shall provide weekly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the Work Breakdown Structure (WBS) to adequately describe the activities of the FOT to the ESMO Project. Reports of anomaly detection, isolation and resolution shall be provided. Planning and status reports shall be provided for all special operations.

C. Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

IV. Government Furnished Facilities, Equipment, Software, and Other Resources

The Government will provide the facilities and the facility services for those EO1 mission support functions performed on site at the GSFC. Office and workstation furniture required to manage and operate the EO1 spacecraft and its ground support elements will be provided. The Contractor shall be accountable for all EO1 GFE

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order.

VI.   Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

VII.   Deliverables

Weekly Spacecraft Performance Report: The Contractor shall generate Weekly S/C Performance Reports. The report shall include, as a minimum, a summary of the overall status and performance of the S/C and its instruments for the week, operational statistics, major upcoming activities, and status, performance, and plans for the S/C and all its instruments. The report shall discuss the results of the trending analysis and highlight any areas of potential concern.

Anomaly Closeout Reports: For each anomaly, the Contractor shall generate an Anomaly Closeout Report. This report shall describe how the anomaly was discovered, what were the results of the anomaly investigation, the impact of the anomaly, any interim work-around (if required), and the final resolution of the anomaly. The Anomaly Closeout Report shall be provided to the ESMO Mission Director within 10 business days of the resolution of the anomaly.

<center>End of Task Order Statement of Work</center>

GSMO TASK ORDER

Task No: **26**
Modification: 0
Task Name: MMS I&T Configuration/Status System
                                            Development & Support
Task Period of Performance: 3/1/12 to 2/28/13
Modification Period of Performance: 3/1/12 to 2/28/13
GSMO SOW Reference: 2.3, 2.4

I.   Task Order History

Description of current modification (Modification 0): Initial task order statement of work for the MMS I&T Configuration/Status System Development & Support task.

Mod #	Start	End	Brief Description
0	03/01/2012	02/28/2013	Initial task order statement of work.

II.   Background

III. Scope of Work

The contractor shall support the development and deployment of an integrated status and configuration tracking system for Magnetospheric Multiscale (MMS) Integration and Test (I&T).

This involves the creation and population of automated tracking spreadsheets which will in turn be hosted on an MMS I&T web resource. Also within the scope is the definition, development and deployment of other key aspects of the system such as posted activity and staffing schedules, near real-time status communication, and integration of information from other MMS Project resources such as the Work Order Authorization (WOA) system and Problem Failure Reporting (PFR) system into the envisioned centralized I&T web resource.

Contractor personnel on this task shall be members of a small MMS project team devoted to this effort

A.   Requirements

B.   Management Reporting

The Contractor shall provide monthly status reports and reviews on the technical, cost, schedule and operational performance in accordance with the WBS to adequately describe the activities of the task to the Task Monitor.

C.   Contractor Controlled Property

The Contractor shall assist the GSMO contract managers and property custodians in maintaining the overall list (NPROP) of government owned property used by the Contractor on this Task Order. This support includes preparation and cooperation during property audits.

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IV. Government Furnished Facilities, Equipment, Software, and Other Resources

V. Material Procurement

The Contractor shall propose material that they identify as necessary to perform the work associated with this Task Order. The Task Monitor shall concur with the materials list prior to procurement.

VI. Travel Support

The Contractor shall propose travel that they identify as necessary to perform the work associated with this Task Order.

VII. Deliverables

End of Task Order Statement of Work